



NASA PATENT ABSTRACTS BIBLIOGRAPHY

A CONTINUING BIBLIOGRAPHY

Section 1 • Abstracts

JANUARY 1990

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0257070

ACCESSION NUMBER RANGES

<i>Bibliography Number</i>	<i>STAR Accession Numbers</i>
NASA SP-7039(04) SEC 1	N69-20701 - N73-33931
NASA SP-7039(12) SEC 1	N74-10001 - N77-34042
NASA SP-7039(13) SEC 1	N78-10001 - N78-22018
NASA SP-7039(14) SEC 1	N78-22019 - N78-34034
NASA SP-7039(15) SEC 1	N79-10001 - N79-21993
NASA SP-7039(16) SEC 1	N79-21994 - N79-34158
NASA SP-7039(17) SEC 1	N80-10001 - N80-22254
NASA SP-7039(18) SEC 1	N80-22255 - N80-34339
NASA SP-7039(19) SEC 1	N81-10001 - N81-21997
NASA SP-7039(20) SEC 1	N81-21998 - N81-34139
NASA SP-7039(21) SEC 1	N82-10001 - N82-22140
NASA SP-7039(22) SEC 1	N82-22141 - N82-34341
NASA SP-7039(23) SEC 1	N83-10001 - N83-23266
NASA SP-7039(24) SEC 1	N83-23267 - N83-37053
NASA SP-7039(25) SEC 1	N84-10001 - N84-22526
NASA SP-7039(26) SEC 1	N84-22527 - N84-35284
NASA SP-7039(27) SEC 1	N85-10001 - N85-22341
NASA SP-7039(28) SEC 1	N85-22342 - N85-36162
NASA SP-7039(29) SEC 1	N86-10001 - N86-22536
NASA SP-7039(30) SEC 1	N86-22537 - N86-33262
NASA SP-7039(31) SEC 1	N87-10001 - N87-20170
NASA SP-7039(32) SEC 1	N87-20171 - N87-30248
NASA SP-7039(33) SEC 1	N88-10001 - N88-20253
NASA SP-7039(34) SEC 1	N88-20254 - N88-30583
NASA SP-7039(35) SEC 1	N89-10001 - N89-20085
NASA SP-7039(36) SEC 1	N89-20086 - N89-30155

NASA

**PATENT
ABSTRACTS
BIBLIOGRAPHY**

A CONTINUING BIBLIOGRAPHY

Section 1 • Abstracts

Annotated references to NASA-owned inventions covered by U.S. patents and applications for patent that were announced in *Scientific and Technical Aerospace Reports (STAR)* between July 1989 and December 1989.



National Aeronautics and Space Administration
Office of Management
Scientific and Technical Information Division
Washington, DC

1990

INTRODUCTION

Several thousand inventions result each year from the aeronautical and space research supported by the National Aeronautics and Space Administration. The inventions having important use in government programs or significant commercial potential are usually patented by NASA. These inventions cover practically all fields of technology and include many that have useful and valuable commercial application.

NASA inventions best serve the interests of the United States when their benefits are available to the public. In many instances, the granting of nonexclusive or exclusive licenses for the practice of these inventions may assist in the accomplishment of this objective. This bibliography is published as a service to companies, firms, and individuals seeking new, licensable products for the commercial market.

The *NASA Patent Abstracts Bibliography (NASA PAB)* is a semiannual NASA publication containing comprehensive abstracts and indexes of NASA-owned inventions covered by U.S. patents and applications for patent. The citations included in *NASA PAB* were originally published in NASA's *Scientific and Technical Aerospace Reports (STAR)* and cover *STAR* announcements made since May 1969.

For the convenience of the user, each issue of *NASA PAB* has a separately bound Abstract Section (Section 1) and Index Section (Section 2). Although each Abstract Section covers only the indicated six-month period, the Index Section is cumulative covering all NASA-owned inventions announced in *STAR* since 1969. Thus a complete set of *NASA PAB* would consist of the Abstract Sections of Issue 04 (January 1974) and Issue 12 (January 1978) and the Abstract Section for all subsequent issues and the Index Section for the most recent issue.

The 63 citations published in this issue of the Abstract Section cover the period July 1989 through December 1989. The Index Section references over 4600 citations covering the period May 1969 through December 1989.

ABSTRACT SECTION (SECTION 1)

This *PAB* issue includes 10 major subject divisions separated into 76 specific categories and one general category/division. (See Table of Contents for the scope note of each category, under which are grouped appropriate NASA inventions.) This scheme was devised in 1975 and revised in 1987 in lieu of the 34 category divisions which were utilized in *PAB* supplements (01) through (06) covering *STAR* abstracts from May 1969 through January 1974. Each entry in the Abstract Section consists of a *STAR* citation accompanied by an abstract and, when appropriate, a key illustration taken from the patent or application for patent. Entries are arranged by subject category in order of the ascending NASA Accession Number originally assigned for *STAR* to the invention. The range of NASA Accession Numbers within each issue is printed on the inside front cover.

Abstract Citation Data Elements: Each of the abstract citations has several data elements useful for identification and indexing purposes, as follows:

- NASA Accession Number
- NASA Case Number
- Inventor's Name
- Title of Invention
- U.S. Patent Application Serial Number
- U.S. Patent Number (for issued patents only)
- U.S. Patent Office Classification Number(s)
(for issued patents only)

These data elements are identified in the Typical Citation and Abstract and in the indexes.

INDEX SECTION (SECTION 2)

The Index Section is divided into five indexes. These indexes are cross-indexed and are used to locate a single invention or groups of inventions.

Subject Index: Lists all inventions according to appropriate alphabetized technical term and indicates the related NASA Case Number, the Subject Category Number, and the Accession Number.

Inventor Index: Lists all inventions according to alphabetized names of inventors and indicates the related NASA Case Number, the Subject Category Number, and the Accession Number.

Source Index: Lists all inventions according to alphabetized source of invention (i.e., name of contractor or government installation where invention was made) and indicates the related NASA Case Number, the Subject Category Number, and the Accession Number.

Number Index: Lists inventions in order of ascending (1) NASA Case Number, (2) U.S. Patent Application Serial Number, (3) U.S. Patent Classification Number, and (4) U.S. Patent Number and indicates the related Subject Category Number and the Accession Number.

Accession Number Index: Lists all inventions in order of ascending Accession Number and indicates the related Subject Category Number, the NASA Case Number, the U.S. Patent Application Serial Number, the U.S. Patent Classification Number, and the U.S. Patent Number.

HOW TO USE THIS PUBLICATION TO IDENTIFY NASA INVENTIONS

To identify one or more NASA inventions within a specific technical field or subject, several techniques are possible with the flexibility incorporated into the *NASA PAB*.

(1) *Using Subject Category:* To identify all NASA inventions in any one of the subject categories in this issue of *NASA PAB*, select the desired Subject Category in the Abstract Section (Section 1) and find the inventions abstracted thereunder.

(2) *Using Subject Index:* To identify all NASA inventions listed under a desired technical subject index term, (A) turn to the cumulative Subject Index in the Index Section and find the invention(s) listed under the desired technical subject term. (B) Note the indicated Accession Number and the Subject Category Number. (C) Using the indicated Accession Number, turn to the inside front cover of the Index Section to determine which issue of the Abstract Section includes the Accession Number desired. (D) To find the abstract of the particular invention in the issue of the Abstract Section selected, (1) use the Subject Category Number to locate the Subject Category and (2) use the Accession Number to locate the desired invention within the Subject Category listing.

(3) *Using Patent Classification Index:* To identify all inventions covered by issued NASA patents (not including applications for patent) within a desired Patent Classification, (A) turn to the Patent Classification Number in the Number Index of Section 2 and find the associated invention(s), and (B) follow the instructions outlined in (2)(B), and (D) above.

TYPICAL CITATION AND ABSTRACT

NASA SPONSORED

ACCESSION NUMBER → **N89-12621*** National Aeronautics and Space Administration.
Lyndon B. Johnson Space Center, Houston, TX. ← **CORPORATE SOURCE**

TITLE → **SPACE STATION ERECTABLE MANIPULATOR PLACEMENT
SYSTEM Patent**

INVENTOR → **MARGARET E. GRIMALDI**, inventor (to NASA) 20 Sep. 1988
7 p Filed 13 Nov. 1986 Supersedes N87-18596 (25 - 11, p 1446)

NASA CASE NUMBER → (NASA-CASE-MS-C-21096-1; US-PATENT-4,772,175;

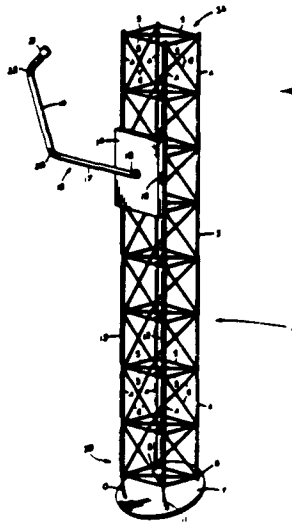
US PATENT APPLICATIONS → US-PATENT-APPL-SN-929865; US-PATENT-CLASS-414-689;
SERIAL NUMBERS → US-PATENT-CLASS-414-718; US-PATENT-CLASS-414-735;
US-PATENT-CLASS-212-225; US-PATENT-CLASS-212-257;
US-PATENT-CLASS-182-103) Avail: US Patent and Trademark ← **AVAILABILITY SOURCE**
Office CSCL 22A

COSATI CODE →

A habitable space station was proposed for low earth orbit, to be constructed from components which will be separately carried up from the earth and thereafter assembled. A suitable manipulating system having extraordinary manipulative capability is required. The invention is an erectable manipulator placement system for use on a space station and comprises an elongate, lattice-like boom having guide tracks attached thereto, a carriage-like assembly pivotally mounted on and extending from said dolly. The system further includes a turntable base pivotally interconnected with the proximal end of the boom and positioned either on a part of a transferring vehicle, or on another payload component being carried by the said transferring vehicle, or on the space station. Novelty resides in the use of a turntable base having a hinged boom with a dolly translatable therealong to carry the arm-like assembly, thus providing an additional 3 degrees of freedom to the arm.

Official Gazette of the U.S. Patent and Trademark Office

← **ABSTRACT**



← **KEY ILLUSTRATION**

TABLE OF CONTENTS

Section 1 • Abstracts

AERONAUTICS

Includes aeronautics (general); aerodynamics; air transportation and safety; aircraft communications and navigation; aircraft design, testing and performance; aircraft instrumentation; aircraft propulsion and power; aircraft stability and control; and research and support facilities (air).

For related information see also *Astronautics*.

01 AERONAUTICS (GENERAL) N.A.

02 AERODYNAMICS N.A.

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer*.

03 AIR TRANSPORTATION AND SAFETY N.A.

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation*.

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION N.A.

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Space Communications*, *Spacecraft Communications*, *Command and Tracking* and *32 Communications and Radar*.

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE N.A.

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics*. For land transportation vehicles see *85 Urban Technology and Transportation*.

06 AIRCRAFT INSTRUMENTATION N.A.

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography*.

07 AIRCRAFT PROPULSION AND POWER 1

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and onboard auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power*, *28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

08 AIRCRAFT STABILITY AND CONTROL N.A.

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

For related information see also *05 Aircraft Design, Testing and Performance*.

09 RESEARCH AND SUPPORT FACILITIES (AIR) 1

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tubes; and aircraft engine test stands.

For related information see also *14 Ground Support Systems and Facilities (Space)*.

ASTRONAUTICS

Includes astronautics (general); astrodynamics; ground support systems and facilities (space); launch vehicles and space vehicles; space transportation; space communications, spacecraft communications, command and tracking; spacecraft design, testing and performance; spacecraft instrumentation; and spacecraft propulsion and power.

For related information see also *Aeronautics*.

12 ASTRONAUTICS (GENERAL) N.A.

For extraterrestrial exploration see *91 Lunar and Planetary Exploration*.

13 ASTRODYNAMICS N.A.

Includes powered and free-flight trajectories; and orbital and launching dynamics.

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE) 2

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.

For related information see also *09 Research and Support Facilities (Air)*.

15 LAUNCH VEHICLES AND SPACE VEHICLES N.A.

Includes boosters; operating problems of launch/space vehicle systems; and reusable vehicles.

For related information see also *20 Spacecraft Propulsion and Power*.

16 SPACE TRANSPORTATION N.A.

Includes passenger and cargo space transportation, e.g., shuttle operations; and space rescue techniques.

For related information see also *03 Air Transportation and Safety* and *18 Spacecraft Design, Testing and Performance*. For space suits see *54 Man/System Technology and Life Support*.

17 SPACE COMMUNICATIONS, SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING N.A.

Includes telemetry; space communications networks; astronavigation and guidance; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications and Radar*.

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE 2

Includes satellites; space platforms; space stations; spacecraft systems and components such as thermal and environmental controls; and attitude controls.

For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance*, *39 Structural Mechanics*, and *16 Space Transportation*.

19 SPACECRAFT INSTRUMENTATION N.A.

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography*.

20 SPACECRAFT PROPULSION AND POWER 4

Includes main propulsion systems and components, e.g. rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion and Power*, *28 Propellants and Fuels*, *44 Energy Production and Conversion*, and *15 Launch Vehicles and Space Vehicles*.

CHEMISTRY AND MATERIALS

Includes chemistry and materials (general); composite materials; inorganic and physical chemistry; metallic materials; nonmetallic materials; propellants and fuels; and materials processing.

23 CHEMISTRY AND MATERIALS (GENERAL) N.A.

24 COMPOSITE MATERIALS 5

Includes physical, chemical, and mechanical properties of laminates and other composite materials.

For ceramic materials see *27 Nonmetallic Materials*.

25 INORGANIC AND PHYSICAL CHEMISTRY 5

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics*.

26 METALLIC MATERIALS 6

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

27 NONMETALLIC MATERIALS 6

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

For composite materials see *24 Composite Materials*.

28 PROPELLANTS AND FUELS N.A.

Includes rocket propellants, igniters and oxidizers; their storage and handling procedures; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power*, *20 Spacecraft Propulsion and Power*, and *44 Energy Production and Conversion*.

29 MATERIALS PROCESSING N.A.

Includes space-based development of products and processes for commercial application.

For biological materials see *55 Space Biology*.

ENGINEERING

Includes engineering (general); communications and radar; electronics and electrical engineering; fluid mechanics and heat transfer; instrumentation and photography; lasers and masers; mechanical engineering; quality assurance and reliability; and structural mechanics.

For related information see also *Physics*.

31 ENGINEERING (GENERAL) 8

Includes vacuum technology; control engineering; display engineering; cryogenics; and fire prevention.

32 COMMUNICATIONS AND RADAR 9

Includes radar; land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Space Communications, Spacecraft Communications, Command and Tracking*. For search and rescue see *03 Air Transportation and Safety*, and *16 Space Transportation*.

33 ELECTRONICS AND ELECTRICAL ENGINEERING 11

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics*.

34 FLUID MECHANICS AND HEAT TRANSFER N.A.

Includes boundary layers; hydrodynamics; fluidics; mass transfer and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics*.

35 INSTRUMENTATION AND PHOTOGRAPHY 12

Includes remote sensors; measuring instruments and gauges; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources and Remote Sensing*. For related information see also *06 Aircraft Instrumentation* and *19 Spacecraft Instrumentation*.

36 LASERS AND MASERS 14

Includes parametric amplifiers.

For related information see also *76 Solid-State Physics*.

37 MECHANICAL ENGINEERING 14

Includes auxiliary systems (nonpower); machine elements and processes; and mechanical equipment.

38 QUALITY ASSURANCE AND RELIABILITY N.A.

Includes product sampling procedures and techniques; and quality control.

39 STRUCTURAL MECHANICS N.A.

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

GEOSCIENCES

Includes geosciences (general); earth resources and remote sensing; energy production and conversion; environment pollution; geophysics; meteorology and climatology; and oceanography.

For related information see also *Space Sciences*.

42 GEOSCIENCES (GENERAL) N.A.

43 EARTH RESOURCES AND REMOTE SENSING N.A.

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography*.

44 ENERGY PRODUCTION AND CONVERSION N.A.

Includes specific energy conversion systems, e.g., fuel cells; global sources of energy; geophysical conversion; and windpower.

For related information see also *07 Aircraft Propulsion and Power*, *20 Spacecraft Propulsion and Power*, and *28 Propellants and Fuels*.

45 ENVIRONMENT POLLUTION 17

Includes atmospheric, noise, thermal, and water pollution.

46 GEOPHYSICS N.A.

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation*.

47 METEOROLOGY AND CLIMATOLOGY N.A.

Includes weather forecasting and modification.

48 OCEANOGRAPHY N.A.

Includes biological, dynamic, and physical oceanography; and marine resources.

For related information see also *43 Earth Resources and Remote Sensing*.

LIFE SCIENCES

Includes life sciences (general); aerospace medicine; behavioral sciences; man/system technology and life support; and space biology.

51 LIFE SCIENCES (GENERAL) 17

52 AEROSPACE MEDICINE N.A.

Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.

53 BEHAVIORAL SCIENCES N.A.

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT 17

Includes human engineering; biotechnology; and space suits and protective clothing.

For related information see also *16 Space Transportation*.

55 SPACE BIOLOGY N.A.

Includes exobiology; planetary biology; and extraterrestrial life.

MATHEMATICAL AND COMPUTER SCIENCES

Includes mathematical and computer sciences (general); computer operations and hardware; computer programming and software; computer systems; cybernetics; numerical analysis; statistics and probability; systems analysis; and theoretical mathematics.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL) N.A.

60 COMPUTER OPERATIONS AND HARDWARE 18

Includes hardware for computer graphics, firmware, and data processing.

For components see *33 Electronics and Electrical Engineering*.

61 COMPUTER PROGRAMMING AND SOFTWARE N.A.

Includes computer programs, routines, algorithms, and specific applications, e.g., CAD/CAM.

62 COMPUTER SYSTEMS 19

Includes computer networks and special application computer systems.

63 CYBERNETICS N.A.

Includes feedback and control theory, artificial intelligence, robotics and expert systems.

For related information see also *54 Man/System Technology and Life Support*.

64 NUMERICAL ANALYSIS N.A.

Includes iteration, difference equations, and numerical approximation.

65 STATISTICS AND PROBABILITY N.A.

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

66 SYSTEMS ANALYSIS N.A.

Includes mathematical modeling; network analysis; and operations research.

67 THEORETICAL MATHEMATICS N.A.

Includes topology and number theory.

PHYSICS

Includes physics (general); acoustics; atomic and molecular physics; nuclear and high-energy physics; optics; plasma physics; solid-state physics; and thermodynamics and statistical physics.

For related information see also *Engineering*.

70 PHYSICS (GENERAL) N.A.

For precision time and time interval (PTTI) see *35 Instrumentation and Photography*; for geophysics, astrophysics or solar physics see *46 Geophysics*, *90 Astrophysics*, or *92 Solar Physics*.

71 ACOUSTICS **N.A.**
Includes sound generation, transmission, and attenuation.
For noise pollution see *45 Environment Pollution*.

72 ATOMIC AND MOLECULAR PHYSICS **19**
Includes atomic structure, electron properties, and molecular spectra.

73 NUCLEAR AND HIGH-ENERGY PHYSICS **N.A.**
Includes elementary and nuclear particles; and reactor theory.
For space radiation see *93 Space Radiation*.

74 OPTICS **20**
Includes light phenomena and optical devices.
For lasers see *36 Lasers and Masers*.

75 PLASMA PHYSICS **N.A.**
Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

76 SOLID-STATE PHYSICS **21**
Includes superconductivity.
For related information see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers*.

77 THERMODYNAMICS AND STATISTICAL PHYSICS **N.A.**
Includes quantum mechanics; theoretical physics; and Bose and Fermi statistics.
For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer*.

SOCIAL SCIENCES

Includes social sciences (general); administration and management; documentation and information science; economics and cost analysis; law, political science, and space policy; and urban technology and transportation.

80 SOCIAL SCIENCES (GENERAL) **N.A.**
Includes educational matters.

81 ADMINISTRATION AND MANAGEMENT **N.A.**
Includes management planning and research.

82 DOCUMENTATION AND INFORMATION SCIENCE **N.A.**
Includes information management; information storage and retrieval technology; technical writing; graphic arts; and micrography.
For computer documentation see *61 Computer Programming and Software*.

83 ECONOMICS AND COST ANALYSIS **N.A.**
Includes cost effectiveness studies.

84 LAW, POLITICAL SCIENCE AND SPACE POLICY **N.A.**
Includes NASA appropriation hearings; aviation law; space law and policy; international law; international cooperation; and patent policy.

85 URBAN TECHNOLOGY AND TRANSPORTATION **N.A.**
Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.
For related information see *03 Air Transportation and Safety*, *16 Space Transportation*, and *44 Energy Production and Conversion*.

SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences*.

88 SPACE SCIENCES (GENERAL) **N.A.**

89 ASTRONOMY **N.A.**
Includes radio, gamma-ray, and infrared astronomy; and astrometry.

90 ASTROPHYSICS **N.A.**
Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust.
For related information see also *75 Plasma Physics*.

91 LUNAR AND PLANETARY EXPLORATION **N.A.**
Includes planetology; and manned and unmanned flights.
For spacecraft design or space stations see *18 Spacecraft Design, Testing and Performance*.

92 SOLAR PHYSICS **N.A.**
Includes solar activity, solar flares, solar radiation and sunspots.
For related information see *93 Space Radiation*.

93 SPACE RADIATION **N.A.**
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

GENERAL

Includes aeronautical, astronautical, and space science related histories, biographies, and pertinent reports too broad for categorization; histories or broad overviews of NASA programs.

99 GENERAL **N.A.**

Note: N.A. means that no abstracts were assigned to this category for this issue.

Section 2 . Indexes

SUBJECT INDEX
INVENTOR INDEX
SOURCE INDEX

CONTRACT NUMBER INDEX
NUMBER INDEX
ACCESSION NUMBER INDEX

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

14

GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.

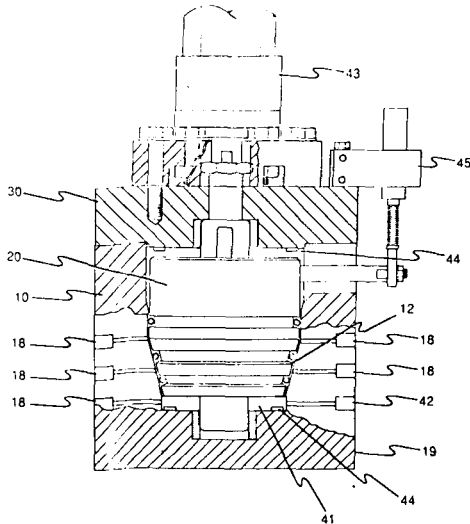
N89-28546*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

O-RING GASKET TEST FIXTURE Patent Application

JAMES ERIC TURNER, inventor (to NASA) and D. SCOTT MCCLUNEY, inventor (to NASA) 5 Jun. 1989 14 p (NASA-CASE-MFS-28376-1; NAS 1.71:MFS-28376-1; US-PATENT-APPL-SN-361479) Avail: NTIS HC A03/MF A01 CSCL 14B

An apparatus is presented for testing O-ring gaskets under a variety of temperature, pressure, and dynamic loading conditions. Specifically, this apparatus has the ability to simulate a dynamic loading condition where the sealing surface in contact with the O-ring moves both away from and axially along the face of the O-ring.

NASA



N89-28547*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

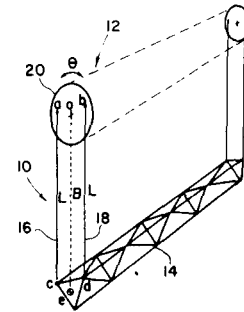
A TORSIONAL SUSPENSION SYSTEM FOR TESTING SPACE STRUCTURES Patent Application

WILMER H. REED, III, inventor (to NASA) and RONALD R. GOLD, inventor (to NASA) (Dynamic Engineering, Inc., Newport News, VA.) 26 May 1989 12 p (NASA-CASE-LAR-14149-1-SB; NAS 1.71:LAR-14149-1-SB; US-PATENT-APPL-SN-357757) Avail: NTIS HC A03/MF A01 CSCL 14B

A low frequency torsional suspension system for testing a space structure uses a plurality of suspension stations attached to the space structure along the length thereof in order to suspend the space structure from an overhead support. Each suspension station includes a disk pivotally mounted to the overhead support, and two cables which have upper ends connected to the disk and lower ends connected to the space structure. The two cables define a parallelogram with the center of gravity of the space structure being vertically beneath the pivot axis of the disk. The vertical distance between the points of attachment of the cables to the disk and the pivot axis of the disk is adjusted to lower the frequency of the suspension system to a level which does not interfere with frequency levels of the space structure, thereby

enabling accurate measurement.

NASA



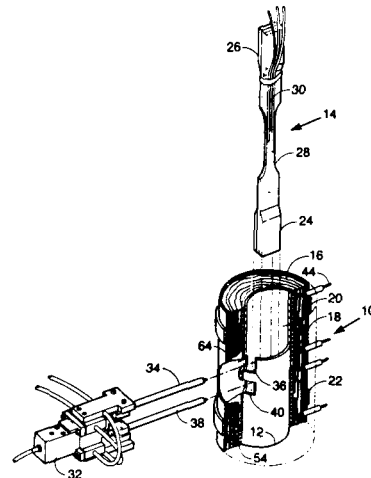
N89-28549*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

FURNACE FOR TENSILE/FATIGUE TESTING Patent Application

PAMELA K. BRINDLEY, inventor (to NASA) 21 Jul. 1989 11 p (NASA-CASE-LEW-14848-1; NAS 1.71:LEW-14848-1; US-PATENT-APPL-SN-382885) Avail: NTIS HC A03/MF A01 CSCL 14B

Mechanical properties of short test specimens are tested in tension and fatigue using an improved electrical resistance heating furnace having a short length that mounts between the grips of a typical testing machine. The furnace includes a ceramic inner liner having an oval cross-section to reduce heat loss at the ends. The furnace is divided into a plurality of individually controlled heating zones. Provision is made to supply an inert gas to the volume around the specimen in the center of the furnace.

NASA



18

SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes satellites; space platforms; space stations; spacecraft systems and components such as thermal and environmental controls; and attitude controls.

N89-25263*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

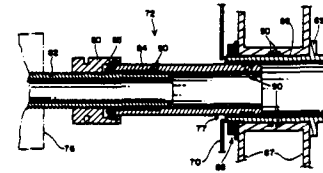
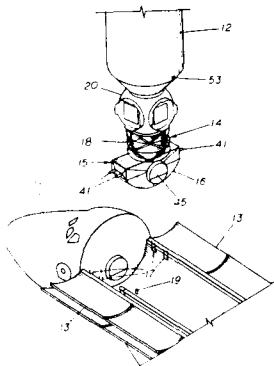
SMART TUNNEL: DOCKING MECHANISM Patent Application

JOHN A. SCHLIESING, inventor (to NASA) and KEVIN L.

EDENBOROUGH, inventor (to NASA) 30 Dec. 1988 16 p
(NASA-CASE-MS-21360-1; NAS 1.71:MSC-21360-1;
US-PATENT-APPL-SN-292131) Avail: NTIS HC A03/MF A01
CSCL 22B

A docking mechanism is presented for the docking of a space vehicle to a space station comprising a flexible tunnel frame structure which is deployable from the space station. The tunnel structure comprises a plurality of series connected frame sections, one end section of which is attached to the space station and the other end attached to a docking module of a configuration adapted for docking in the payload bay of the space vehicle. The docking module is provided with trunnions, adapted for latching engagement with latches installed in the vehicle payload bay and with hatch means connectable to a hatch of the crew cabin of the space vehicle. Each frame section comprises a pair of spaced ring members, interconnected by actuator-attenuator devices which are individually controllable by an automatic control means to impart relative movement of one ring member to the other in six degrees of freedom of motion. The control means includes computer logic responsive to sensor signals of range and attitude information, capture latch condition, structural loads, and actuator stroke for generating commands to the onboard flight control system and the individual actuator-attenuators to deploy the tunnel to effect a coupling with the space vehicle and space station after coupling. A tubular fluid-impervious liner, preferably fabric, is disposed through the frame sections of a size sufficient to accommodate the passage of personnel and cargo.

NASA



is detailed.

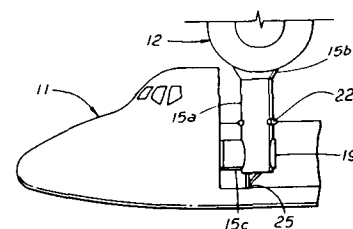
Official Gazette of the U.S. Patent and Trademark Office

N89-28552* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

DOCKING MECHANISM FOR SPACECRAFT Patent Application
GREGORY A. LANGE, inventor (to NASA), JOHN P. MCMANAMEN, inventor (to NASA), and JOHN A. SCHLIESING, inventor (to NASA) 30 Dec. 1988 24 p
(NASA-CASE-MS-21386-1; NAS 1.71:MSC-21386-1;
US-PATENT-APPL-SN-292123) Avail: NTIS HC A03/MF A01
CSCL 22B

A system is presented for docking a space vehicle to a space station where a connecting tunnel for in-flight transfer of personnel is required. Cooperable coupling mechanisms include docking rings on the space vehicle and space station. The space station is provided with a tunnel structure, a retraction mechanism, and a docking ring. The vehicle coupling mechanism is designed to capture the station coupling mechanism, arrest relative spacecraft motions while limiting loads to acceptable levels, and then realign the spacecraft for final docking and tunnel interconnection. The docking ring of the space vehicle coupling mechanism is supported by linear attenuator actuator devices, each of which is controlled by a control system which receives loading information signals and attenuator stroke information signals from each device and supplies output signals for controlling its linear actuation to attenuate impact loading or to realign the spacecraft for final docking and tunnel interconnection. The retraction mechanism is used to draw the spacecraft together after initial contact and coupling. Tunnel trunnions, cooperative with the latches on the space vehicle constitute the primary structural tie between the spacecraft in final docked configuration.

NASA



N89-25266* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

SPACE STATION ARCHITECTURE, MODULE, BERTHING HUB, SHELL ASSEMBLY, BERTHING MECHANISM AND UTILITY CONNECTION CHANNEL Patent

MARC M. COHEN, inventor (to NASA) 28 Feb. 1989 15 p
(NASA-CASE-ARC-11505-2; US-PATENT-4,807,834;
US-PATENT-APPL-SN-159072; US-PATENT-CLASS-244-159;
US-PATENT-CLASS-244-161; US-PATENT-CLASS-285-302)
Avail: US Patent and Trademark Office CSCL 22B

A Space Station includes a plurality of modules, and berthing hubs, joined by interconnections which are sideways connectable. The modules and hubs are fastened together in a triangular configuration in three dimensions. The interconnections include a pair of opposed, axially aligned, flanged ports, and a clamp latch formed from a plurality of sections hinged along their length and extending circumferentially around the flanged ports. A utilities connection channel extends between ports. The channel has a shell with utilities connectors movable between an extended position to mating connectors in the modules and a withdrawn position. Assembly sequence and common module shell structure

N89-28553* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

SPACE MODULE ASSEMBLY APPARATUS WITH DOCKING ALIGNMENT FLEXIBILITY AND RESTRAINT Patent

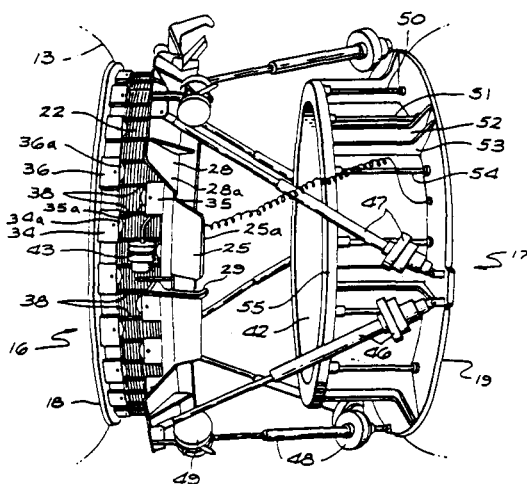
WILLIE D. WHITAKER, inventor (to NASA) (McDonnell-Douglas Corp., Long Beach, CA.) 7 Mar. 1989 9 p Filed 8 Oct. 1987
(NASA-CASE-MS-21211-1; US-PATENT-4,809,936;
US-PATENT-APPL-SN-105841; US-PATENT-CLASS-244-161;
US-PATENT-CLASS-244-159; US-PATENT-CLASS-403-51;
US-PATENT-CLASS-285-226) Avail: U.S. Patent and Trademark Office CSCL 22B

A berthing mechanism especially for use in berthing and compliant air-tight securing between manned space vehicle and modules is disclosed. The interface is provided by a pair of annular rings, one of which is typically, mechanically attached to the vehicle

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

and the other to the module to which it is to be docked and secured. One of the two rings is attached to a base by resilient bellows. The facing surface of one annular ring is joined to a base by a cable laced through alternating pulleys attached circumferentially so that the interface surface of that ring may be tilted to accommodate angular misalignment as the annular rings are brought into docking (berthing) contact. Interleaving guide flanges with chambered sides provide at least some rotational misalignment correction. A plurality of electromechanical actuator/attenuator units provide means for extending one annular ring toward the other in the final stages of docking, for absorbing the initial docking shock and for drawing the annular rings into tight interface contact. Locking hooks provide for securing the interfaces.

Official Gazette of the U.S. Patent and Trademark Office



N89-28554* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

EXPANDABLE PALLET FOR SPACE STATION INTERFACE ATTACHMENTS Patent

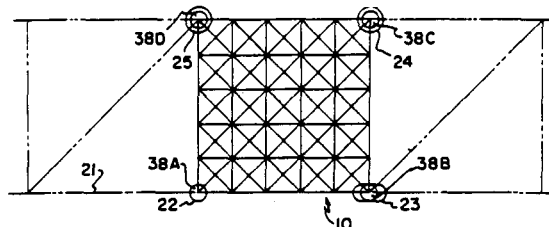
CLARENCE J. WESSELSKI, inventor (to NASA) 21 Feb. 1989 11 p Filed 21 Apr. 1988 Division of US-Patent-Appl-SN-929875, filed 13 Nov. 1986

(NASA-CASE-MSC-21117-2; US-PATENT-4,805,368; US-PATENT-APPL-SN-184233; US-PATENT-APPL-SN-929875; US-PATENT-CLASS-52-573; US-PATENT-CLASS-403-4; US-PATENT-CLASS-403-30; US-PATENT-CLASS-248-DIG-1; US-PATENT-CLASS-52-648) Avail: U.S. Patent and Trademark Office CSDL 22B

A foldable expandable pallet having a basic square configuration is disclosed. Each pallet is comprised of a plurality of struts, joined together by node point fittings to make a rigid structure. Some of the struts have hinge fittings and are spring loaded to permit collapse of the module for stowage and transport to a space station. Dimensions of the pallet are selected to provide convenient, closely spaced attachment points between the relatively widely spaced trusses of a space station platform. A pallet is attached to a truss at four points; one close fitting hole; two oversize holes; and a slot; to allow for thermal expansion/contraction and for manufacturing tolerances. Applications of the pallet include its use in rotary or angular joints; servicing of splints; with gridded plates; as an instrument mounting bases; and as a roadbed for a Mobile

Service Center (MSC).

Official Gazette of the U.S. Patent and Trademark Office



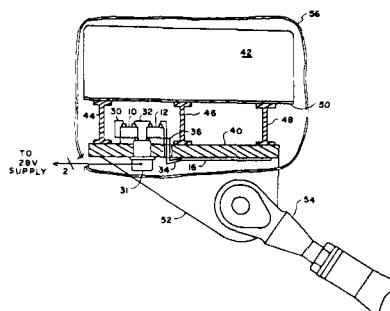
N89-28556* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

SPACECRAFT COMPONENT HEATER CONTROL SYSTEM Patent Application

FREDERICK D. BACHTEL, inventor (to NASA) and JAMES W. OWEN, inventor (to NASA) 5 Jun. 1989 16 p (NASA-CASE-MFS-28327-1; NAS 1.71:MFS-28327-1; US-PATENT-APPL-SN-361200) Avail: NTIS HC A03/MF A01 CSDL 22B

A heater control circuit is disclosed as being constructed in a single integrated circuit, with the integrated circuit conveniently mounted proximate to a spacecraft component requiring temperature control. Redundant heater controllers control power applied to strip heaters disposed to provide heat to a component responsive to sensed temperature from temperature sensors. Signals from these sensors are digitized and compared with a dead band temperature and set point temperature stored in memory to generate an error signal if the sensed temperature is outside the parameter stored in the memory. This error signal is utilized by a microprocessor to selectively instruct the heater controllers to apply power to the strip heaters. If necessary, the spacecraft central processor may access or interrogate the microprocessor in order to alter the set point temperature and dead band temperature range to obtain operational data relating to the operation of an integrated circuit for relaying to the ground control, or to switch off faulty components.

NASA



20

SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources.

N89-25279* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

HYBRID PLUME PLASMA ROCKET Patent

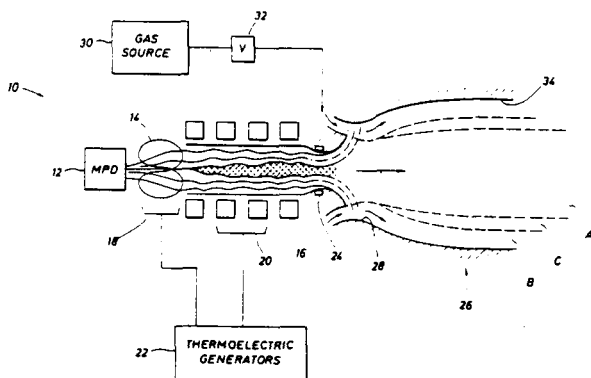
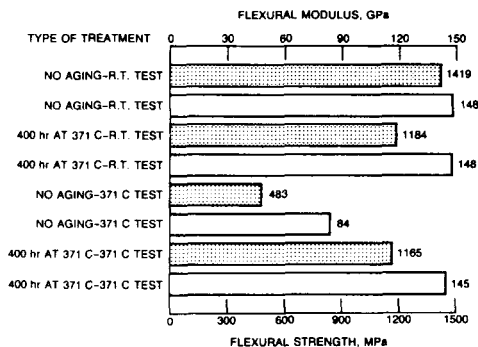
FRANKLIN R. CHANG, inventor (to NASA) 28 Mar. 1989 12 p (NASA-CASE-MSC-20476-2; US-PATENT-4,815,279; US-PATENT-APPL-SN-046341; US-PATENT-CLASS-60-202; US-PATENT-CLASS-60-264; US-PATENT-CLASS-239-265.17) Avail: U.S. Patent and Trademark Office CSDL 20C

A technique for producing thrust by generating a hybrid plume plasma exhaust is disclosed. A plasma flow is generated and introduced into a nozzle which features one or more inlets positioned to direct a flow of neutral gas about the interior of the nozzle. When such a neutral gas flow is combined with the plasma flow within the nozzle, a hybrid plume is constructed including a flow of hot plasma along the center of the nozzle surrounded by a generally annular flow of neutral gas, with an annular transition region between the pure plasma and the neutral gas. The temperature of the outer gas layer is below that of the pure plasma and generally separates the pure plasma from the interior surfaces of the nozzle. The neutral gas flow both insulates the nozzle wall from the high temperatures of the plasma flow and adds to the mass flow rate of the hybrid exhaust. The rate of flow of neutral gas into the interior of the nozzle may be selectively adjusted to control the thrust and specific impulse of the device.

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are used.

NASA



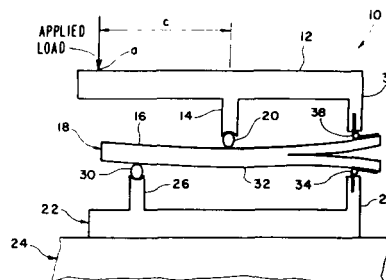
N89-28586*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

DELAMINATION TEST APPARATUS AND METHOD Patent Application

JOHN H. CREWS, JR., inventor (to NASA) and JAMES R. REEDER, inventor (to NASA) 28 Jul. 1989 16 p
(NASA-CASE-LAR-13985-1; NAS 1.71:LAR-13985-1;
US-PATENT-APPL-SN-386172) Avail: NTIS HC A03/MF A01
CSCL 11D

A delamination test apparatus and method uses a single beam to simultaneously apply opening and shear stresses to a test specimen. A fulcrum extending downwardly from the beam produces shear stress in the specimen by downward movement, and opening stress by pivotal upward movement of the beam, which results by virtue of the fact that the applied load is on one side of the fulcrum while the test specimen is connected to the beam on the opposite side of the fulcrum.

NASA



24

COMPOSITE MATERIALS

Includes physical, chemical, and mechanical properties of laminates and other composite materials.

N89-23623*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

LIGHT WEIGHT POLYMER MATRIX COMPOSITE MATERIAL Patent Application

KENNETH J. BOWLES, inventor (to NASA) and CARL E. LOWELL, inventor (to NASA) 5 Dec. 1988 16 p Sponsored by NASA. Lewis Research Center
(NASA-CASE-LEW-14734-1; NAS 1.71:LEW-14734-1;
US-PATENT-APPL-SN-279624) Avail: NTIS HC A03/MF A01
CSCL 11D

A graphite fiber reinforced polymer matrix is layed up, cured, and thermally aged at about 750 F in the presence of an inert gas. The heat treatment improves the structural integrity and alters the electrical conductivity of the materials. In the preferred embodiment PMR-15 polyimides and Celion-6000 graphite fibers

25

INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

N89-28603*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

CONTROLLED METHOD OF REDUCING ELECTROPHORETIC MOBILITY OF VARIOUS SUBSTANCES Patent Application

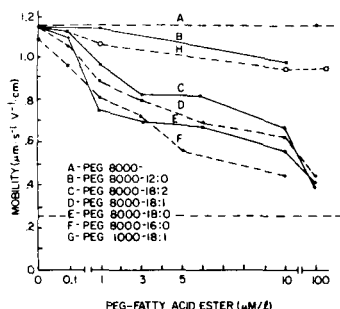
JAMES M. VANALSTINE, inventor (to NASA) (Universities Space

26 METALLIC MATERIALS

Research Association, Huntsville, AL.) 7 Jul. 1989 20 p
(NASA-CASE-MFS-26049-1-NP; NAS 1.71:MFS-26049-1-NP;
US-PATENT-APPL-SN-376487) Avail: NTIS HC A03/MF A01
CSC 07D

A method of reducing electrophoretic mobility of macromolecules, particles, cells, and the like is provided. The method comprises interacting the particles or cells with a polymer-linked affinity compound composed of: a hydrophilic neutral polymer such as polyethylene glycol, and an affinity component consisting of a hydrophobic compound such as a fatty acid ester, an immunocompound such as an antibody or active fragment thereof or similar macromolecule, or other ligands. The reduction of electrophoretic mobility achieved is directly proportional to the concentration of the polymer-linked affinity compound employed, and the mobility reduction obtainable is up to 100 percent for particular particles and cells. The present invention is advantageous in that analytical electrophoretic separation can not be achieved for macromolecules, particles, and cells whose native surface charge structure had prevented them from being separated by normal electrophoretic means. Depending on the affinity component utilized, separation can be achieved on the basis of specific/irreversible, specific/reversible, semi-specific/reversible, relatively nonspecific/reversible, or relatively nonspecific/irreversible ligand-substance interactions. The present method is also advantageous in that it can be used in a variety of standard laboratory electrophoresis equipment.

NASA



26

METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N89-28621* National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

ALUMINUM ALLOY Patent

LINDA B. BLACKBURN, inventor (to NASA) and EDGAR A. STARKE, JR., inventor (to NASA) (Virginia Univ., Charlottesville.) 11 Apr. 1989 5 p Filed 23 Mar. 1988 Supersedes N88-24753 (26 - 18, p 2487)

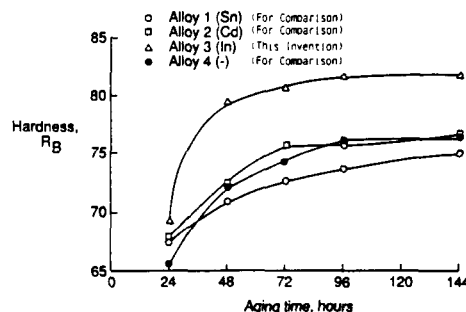
(NASA-CASE-LAR-13924-1-CU; US-PATENT-4,820,488;
US-PATENT-APPL-SN-172102; US-PATENT-CLASS-420-529;
US-PATENT-CLASS-148-159; US-PATENT-CLASS-148-416;
US-PATENT-CLASS-148-417; US-PATENT-CLASS-420-533)
Avail: U.S. Patent and Trademark Office CSC 11F

This invention relates to aluminum alloys, particularly to aluminum-copper-lithium alloys containing at least about 0.1 percent by weight of indium as an essential component, which are suitable for applications in aircraft and aerospace vehicles. At least about 0.1 percent by weight of indium is added as an essential component to an alloy which precipitates a T1 phase (Al₂CuLi). This addition enhances the nucleation of the precipitate T1 phase, producing a microstructure which provides excellent strength as indicated by

Rockwell hardness values and confirmed by standard tensile tests.

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Al-2.3Cu-2.3Li-0.15Zr-x ALLOYS AGED AT 160°C



27

NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N89-23692* National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

PROCESSABLE POLYIMIDE ADHESIVE AND MATRIX COMPOSITE RESIN Patent Application

J. RICHARD PRATT, inventor (to NASA) (PRC Kentron, Inc., Hampton, VA.), TERRY L. STCLAIR, inventor (to NASA), and DONALD J. PROGAR, inventor (to NASA) 2 Nov. 1988 15 p Sponsored by NASA. Langley Research Center (NASA-CASE-LAR-14101-1; NAS 1.71:LAR-14101-1; US-PATENT-APPL-SN-266045) Avail: NTIS HC A03/MF A01 CSC 11A

A high temperature polyimide composition prepared by reacting 4,4'-isophthaloyldiphthalic anhydride with metaphenylenediamine is employed to prepare matrix resins, adhesives, films, coatings, moldings, and laminates.

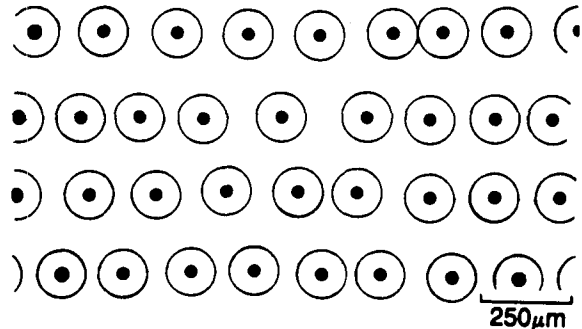
NASA

N89-25334* National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

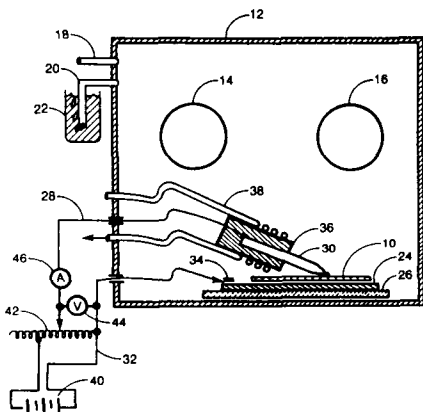
SEMIINTERPENETRATING POLYMER NETWORK FOR TOUGHER AND MORE MICROCRACKING RESISTANT HIGH TEMPERATURE POLYMERS Patent Application

RUTH H. PATER, inventor (to NASA) 26 Jan. 1989 26 p (NASA-CASE-LAR-13925-1; NAS 1.71:LAR-13925-1; US-PATENT-APPL-SN-301925) Avail: NTIS HC A03/MF A01 CSC 11B

This invention is a semi-interpenetrating polymer network which includes a high performance thermosetting polyimide having a nadic end group acting as a crosslinking site and a high performance linear thermoplastic polyimide. Provided is an improved high temperature matrix resin which is capable of performing at 316 C in air for several hundreds of hours. This resin has significantly improved toughness and microcracking resistance, excellent



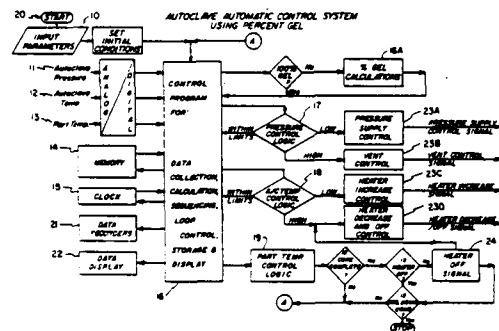
NASA



A strong and tough SiC/RBSN composite material is comprised of silicon fibers and a reaction bonded silicon nitride (RBSN) matrix.

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ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; cryogenics; and fire prevention.

N89-23738*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

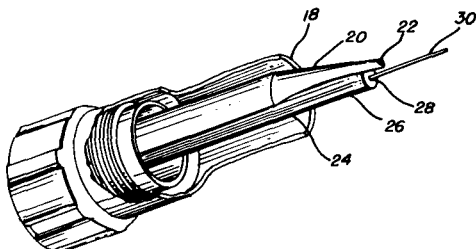
ELECTRODE CARRYING WIRE FOR GTAW WELDING Patent Application

GENE MORGAN, inventor (to NASA) and GERALD DYER, inventor (to NASA) (Rockwell International Corp., Huntsville, AL.) 5 Dec. 1988 8 p

(NASA-CASE-MFS-29491-1; NAS 1.71:MFS-29491-1; US-PATENT-APPL-SN-279677) Avail: NTIS HC A02/MF A01 CSCL 13B

A welding torch for gas tungsten arc welding apparatus has a hollow tungsten electrode including a ceramic liner and forms the filler metal wire guide. The wire is fed through the tungsten electrode thereby reducing the size of torch to eliminate clearance problems which exist with external wire guides. Since the wire is preheated from the tungsten more wire may be fed into the weld puddle, and the wire will not oxidize because it is always within the shielding gas.

NASA



N89-23739*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

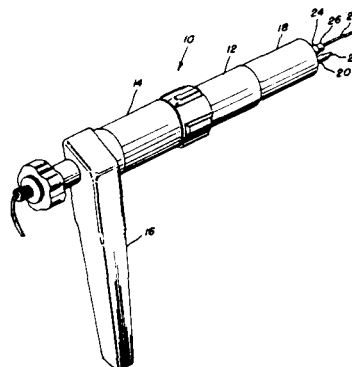
INTERNAL WIRE GUIDE FOR GTAW WELDING Patent Application

GENE MORGAN, inventor (to NASA) and GERALD DYER, inventor (to NASA) (Rockwell International Corp., Huntsville, AL.) 5 Dec. 1988 8 p Sponsored by NASA. Marshall Space Flight Center (NASA-CASE-MFS-29489-1; NAS 1.71:MFS-29489-1; US-PATENT-APPL-SN-279625) Avail: NTIS HC A02/MF A01 CSCL 13B

A welding torch for gas tungsten arc welding apparatus has a filler metal wire guide positioned within the torch, and within the shielding gas nozzle. The wire guide is adjacent to the tungsten electrode and has a ceramic liner through which the wire is fed. This reduces the size of the torch and eliminates the outside clearance problems that exist with external wire guides. Additionally, since the wire is always within the shielding gas, oxidizing of the

wire is eliminated.

NASA



N89-29577*# National Aeronautics and Space Administration. Pasadena Office, CA.

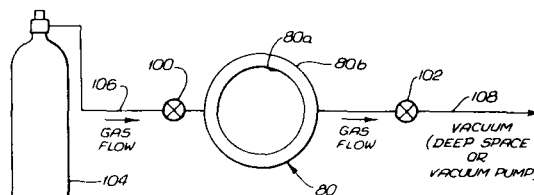
TWO STAGE SORPTION TYPE CRYOGENIC REFRIGERATOR INCLUDING HEAT REGENERATION SYSTEM Patent Application

JACK A. JONES, inventor (to NASA), LIANG-CHI WEN, inventor (to NASA), and STEVEN BARD, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 31 Jan. 1989 27 p (Contract NAS7-918)

(NASA-CASE-NPO-17630-1-CU; NAS 1.71:NPO-17630-1-CU; US-PATENT-APPL-SN-304149) Avail: NTIS HC A03/MF A01 CSCL 13B

A lower stage chemisorption refrigeration system physically and functionally coupled to an upper stage physical adsorption refrigeration system is disclosed. Waste heat generated by the lower stage cycle is regenerated to fuel the upper stage cycle thereby greatly improving the energy efficiency of a two-stage sorption refrigerator. The two stages are joined by disposing a first pressurization chamber providing a high pressure flow of a first refrigerant for the lower stage refrigeration cycle within a second pressurization chamber providing a high pressure flow of a second refrigerant for the upper stage refrigeration cycle. The first pressurization chamber is separated from the second pressurization chamber by a gas-gap thermal switch which at times is filled with a thermoconductive fluid to allow conduction of heat from the first pressurization chamber to the second pressurization chamber.

NASA



N89-29578*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

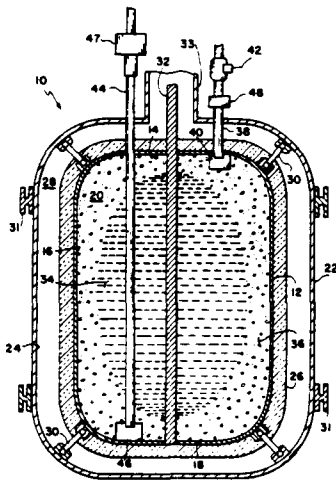
SURFACE TENSION CONFINED LIQUID CRYOGEN COOLER Patent

STEPHEN H. CASTLES, inventor (to NASA) and MICHAEL E.

SCHEIN, inventor (to NASA) 18 Apr. 1989 6 p Filed 13 Jun. 1988 Supersedes N88-29050 (26 - 23, p 3201)
(NASA-CASE-GSC-13112-1; US-PATENT-4,821,907;
US-PATENT-APPL-SN-205771; US-PATENT-CLASS-220-5A;
US-PATENT-CLASS-220-901; US-PATENT-CLASS-62-45;
US-PATENT-CLASS-62-48; US-PATENT-CLASS-206-0.7) Avail:
U.S. Patent and Trademark Office CSCL 13B

A cryogenic cooler is provided for use in craft such as launch, orbital, and space vehicles subject to substantial vibration, changes in orientation, and weightlessness. The cooler contains a small pore, large free volume, low density material to restrain a cryogen through surface tension effects during launch and zero-g operations and maintains instrumentation within the temperature range of 10 to 140 K. The cooler operation is completely passive, with no inherent vibration or power requirements.

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32

COMMUNICATIONS AND RADAR

Includes radar; land and global communications; communications theory; and optical communications.

N89-25360*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

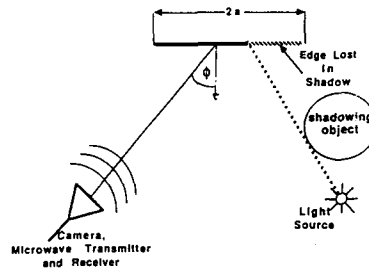
METHOD AND APPARATUS FOR SENSOR FUSION Patent Application

KUMAR KRISHEN, inventor (to NASA), SCOTT SHAW, inventor (to NASA), and RUI J. P. DEFIGUEIREDO, inventor (to NASA) 30 Dec. 1988 60 p
(NASA-CASE-MSC-21334-1; NAS 1.71:MSC-21334-1;
US-PATENT-APPL-SN-292130) Avail: NTIS HC A04/MF A01 CSCL 17I

Method and apparatus for fusion of data from optical and radar sensors by error minimization procedure is presented. The method was applied to the problem of shape reconstruction of an unknown surface at a distance. The method involves deriving an incomplete surface model from an optical sensor. The unknown characteristics of the surface are represented by some parameter. The correct value of the parameter is computed by iteratively generating theoretical predictions of the radar cross sections (RCS) of the surface, comparing the predicted and the observed values for the RCS, and improving the surface model from results of the comparison. Theoretical RCS may be computed from the surface model in several ways. One RCS prediction technique is the method of moments. The method of moments can be applied to an unknown surface only if some shape information is available from

an independent source. The optical image provides the independent information.

NASA



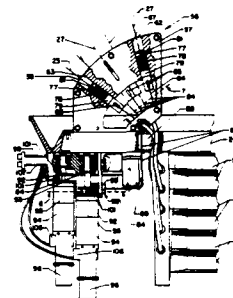
N89-25363* National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

ANTENNA SURFACE CONTOUR CONTROL SYSTEM Patent

ELVIN L. AHL, inventor (to NASA) and JAMES B. MILLER, inventor (to NASA) 7 Mar. 1989 14 p
(NASA-CASE-LAR-13798-1; US-PATENT-4,811,033;
US-PATENT-APPL-SN-118995; US-PATENT-CLASS-343-880;
US-PATENT-CLASS-343-915; US-PATENT-CLASS-343-DIG.2)
Avail: U.S. Patent and Trademark Office

The invention is a system for automatically controlling the surface contour of a deployable and restowable antenna having a mesh reflector surface supported by a circular, folding hoop affixed to a central, telescoping column. The antenna, when deployed, forms a quad-aperture reflector with each quadrant of the mesh surface shaped to provide an offset parabolic radio frequency (RF) reflector. The hoop is supported and positioned by quartz support cords attached to the top of a column and by lower graphite hoop control cords that extend between the hoop and base of the column. The antenna, an RF reflective surface, is a gold plated molybdenum wire mesh supported on a graphite cord truss structure that includes the hoop control cords and a plurality of surface control cords attached at selected points on the surface and to the base of the column. The contour of the three-dimensional surface of the antenna is controlled by selectively adjusting the lengths of the surface control cords and the graphite hoop control cords by means of novel actuator assemblies that automatically sense and change the lengths of the lower hoop control cords and surface control cords.

Official Gazette of the U.S. Patent and Trademark Office



N89-28672* National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

ALMOND TEST BODY Patent

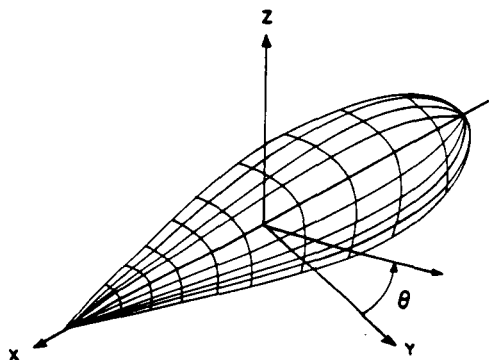
ALLEN K. DOMINEK, inventor (to NASA) (Ohio State Univ., Columbus.), RICHARD M. WOOD, inventor (to NASA), and MELVIN C. GILREATH, inventor (to NASA) 28 Feb. 1989 4 p Filed 23 May 1988 Supersedes N88-24845 (26 - 18, p 2502)
(NASA-CASE-LAR-13747-1-CU; US-PATENT-4,809,003;
US-PATENT-APPL-SN-197191; US-PATENT-CLASS-342-165;
US-PATENT-CLASS-342-1; US-PATENT-CLASS-342-5) Avail:

32 COMMUNICATIONS AND RADAR

U.S. Patent and Trademark Office CSCL 20N

The invention is an almond shaped test body for use in measuring the performance characteristics of microwave anechoic chambers and for use as a support for components undergoing radar cross-section measurements. The novel aspect of this invention is its shape, which produces a large dynamic scattered field over large angular regions making the almond valuable for verifying the performance of microwave anechoic chambers. As a component mount, the almond exhibits a low return that does not perturb the measurement of the component and it simulates the backscatter characteristics of the component as if over an infinite ground plane.

Official Gazette of the U.S. Patent and Trademark Office



N89-28676* National Aeronautics and Space Administration. Pasadena Office, CA.

TELEVISION MONITOR FIELD SHIFTER AND AN OPTO-ELECTRONIC METHOD FOR OBTAINING A STEREO IMAGE OF OPTIMAL DEPTH RESOLUTION AND REDUCED DEPTH DISTORTION ON A SINGLE SCREEN Patent

DANIEL B. DINER, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 4 Apr. 1989 19 p Filed 25 Nov. 1987

(Contract NAS7-918)

(NASA-CASE-NPO-17249-1-CU; US-PATENT-4,819,064;

US-PATENT-APPL-SN-125666; US-PATENT-CLASS-358-88;

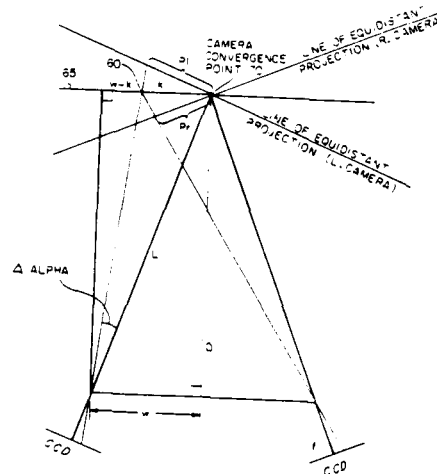
US-PATENT-CLASS-358-91; US-PATENT-CLASS-358-92) Avail:

U.S. Patent and Trademark Office CSCL 17B

A method and apparatus is developed for obtaining a stereo image with reduced depth distortion and optimum depth resolution. Static and dynamic depth distortion and depth resolution tradeoff is provided. Cameras obtaining the images for a stereo view are converged at a convergence point behind the object to be presented in the image, and the collection-surface-to-object distance, the camera separation distance, and the focal lengths of zoom lenses for the cameras are all increased. Doubling the distances cuts the static depth distortion in half while maintaining image size and depth resolution. Dynamic depth distortion is minimized by panning a stereo view-collecting camera system about a circle which passes through the convergence point and the camera's first nodal points. Horizontal field shifting of the television fields on a television monitor brings both the monitor and the

stereo views within the viewer's limit of binocular fusion.

Official Gazette of the U.S. Patent and Trademark Office



N89-28684* National Aeronautics and Space Administration. Pasadena Office, CA.

DIGITAL CARRIER DEMODULATOR EMPLOYING COMPONENTS WORKING BEYOND NORMAL LIMITS Patent Application

WILLIAM J. HURD, inventor (to NASA) and RAMIN SADR, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 12 May 1987 10 p

(Contract NAS7-918)

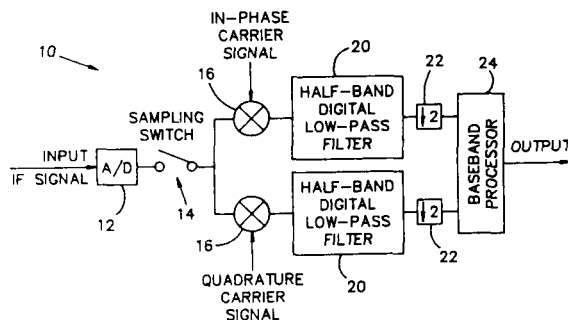
(NASA-CASE-NPO-17628-1-CU; NAS 1.71:NPO-17628-1-CU;

US-PATENT-APPL-SN-350813) Avail: NTIS HC A02/MF A01

CSCL 17B

In a digital device, having an input comprised of a digital sample stream at a frequency F , a method is disclosed for employing a component designed to work at a frequency less than F . The method, in general, is comprised of the following steps: dividing the digital sample stream into odd and even digital samples streams each at a frequency of $F/2$; passing one of the digital sample streams through the component designed to work at a frequency less than F where the component responds only to the odd or even digital samples in one of the digital sample streams; delaying the other digital sample streams for the time it takes the digital sample stream to pass through the component; and adding the one digital sample stream after passing through the component with the other delayed digital sample streams. In the specific example, the component is a finite impulse response filter of the order $((N + 1)/2)$ and the delaying step comprised passing the other digital sample streams through a shift register for a time (in sampling periods) of $((N + 1)/2) + r$, where r is a pipeline delay through the finite impulse response filter.

NASA



ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

N89-28713* National Aeronautics and Space Administration. Pasadena Office, CA.

SYSTOLIC VLSI ARRAY FOR IMPLEMENTING THE KALMAN FILTER ALGORITHM Patent

JAW J. CHANG, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) and HEN-GEUL YEH, inventor (to NASA) 18 Apr. 1989 12 p Filed 1 Apr. 1987

(Contract NAS7-918)

(NASA-CASE-NPO-17108-1-CU; US-PATENT-4,823,299;

US-PATENT-APPL-SN-032819; US-PATENT-CLASS-364-735;

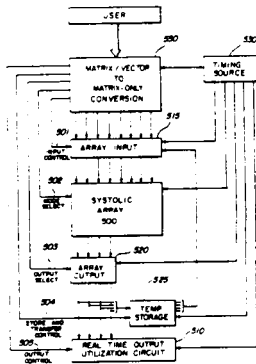
US-PATENT-CLASS-364-754; US-PATENT-CLASS-364-724.01;

US-PATENT-CLASS-364-724.05) Avail: U.S. Patent and

Trademark Office CSCL 09A

A method and apparatus for processing signals representative of a complex matrix/vector equation is disclosed and claimed. More particularly, signals representing an orderly sequence of the combined matrix and vector equation, known as a Kalman filter algorithm, is processed in real-time in accordance with the principles of this invention. The Kalman filter algorithm is converted into a Faddeev algorithm, which is a matrix-only algorithm. The Faddeev algorithm is modified to represent both the matrix and vector portions of the Kalman filter algorithm. The modified Faddeev algorithm is embodied into electrical signals which are applied as inputs to a systolic array processor, which performs triangulation and nullification on the input signals, and delivers an output signal to a real-time utilization circuit.

Official Gazette of the U.S. Patent and Trademark Office



N89-29679*# National Aeronautics and Space Administration. Pasadena Office, CA.

INTEGRATED CIRCUIT RELIABILITY TESTING Patent Application

MARTIN G. BUEHLER, inventor (to NASA) and HOSHYAR R. SAYAH, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 5 Dec. 1988 14 p

(Contract NAS7-918)

(NASA-CASE-NPO-17393-1-CU; NAS 1.71:NPO-17393-1-CU;

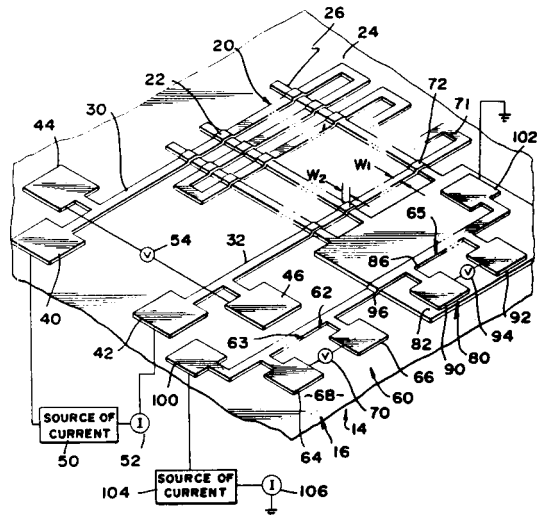
US-PATENT-APPL-SN-279676) Avail: NTIS HC A03/MF A01

CSCL 09A

A technique is described for use in determining the reliability of microscopic conductors deposited on an uneven surface of an integrated circuit device. A wafer containing integrated circuit chips

is formed with a test area having regions of different heights. At the time the conductors are formed on the chip areas of the wafer, an elongated serpentine assay conductor is deposited on the test area so the assay conductor extends over multiple steps between regions of different heights. Also, a first test conductor is deposited in the test area upon a uniform region of first height, and a second test conductor is deposited in the test area upon a uniform region of second height. The occurrence of high resistances at the steps between regions of different height is indicated by deriving the measured length of the serpentine conductor using the resistance measured between the ends of the serpentine conductor, and comparing that to the design length of the serpentine conductor. The percentage by which the measured length exceeds the design length, at which the integrated circuit will be discarded, depends on the required reliability of the integrated circuit.

NASA



N89-29681* National Aeronautics and Space Administration. Pasadena Office, CA.

LOW POWER CONSUMPTION CURRENT TRANSDUCER Patent

W. T. MCLYMAN, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 18 Apr. 1989 7 p Filed 15 Dec. 1987 Supersedes N88-23937 (26 - 17, p 2335)

(Contract NAS7-918)

(NASA-CASE-NPO-16888-1-CU; US-PATENT-4,823,074;

US-PATENT-APPL-SN-133412; US-PATENT-CLASS-324-117;

US-PATENT-CLASS-324-127; US-PATENT-CLASS-330-8) Avail:

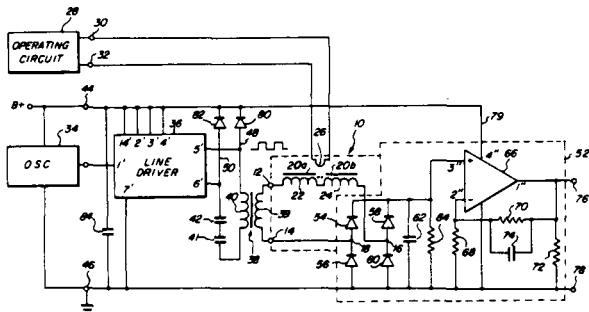
U.S. Patent and Trademark Office CSCL 09A

A low power consumption current transducer utilizes a saturable core reactor which includes a pair of opposed gate windings and a control winding. The control winding of the saturable reactor is arranged to receive the current to be measured. A square wave generator is connected to the gate winding of the transformer connected across the square wave generator and the secondary connected in series with the gate windings of the reactor. A full wave rectifier is connected to the gate windings and a resistor is connected across the rectifier to provide a DC voltage to cross it representative of the current flow through the control winding. A DC power supply is provided to supply power to the square wave voltage source. A diode is connected between each end of the primary winding of the transformer and one polarity of the DC power supply to commutate the reactive current resulting from the counter emf generated in the reactor back to the DC supply to eliminate potentially damaging reactive voltage spikes which would otherwise appear at the output of the square wave generator

35 INSTRUMENTATION AND PHOTOGRAPHY

and conserve energy.

Official Gazette of the U.S. Patent and Trademark Office



35

INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

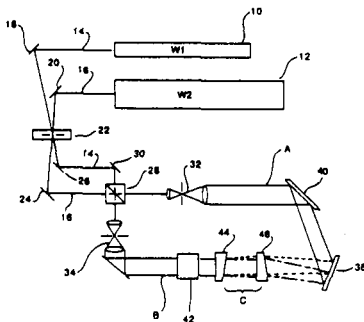
N89-26202* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

DUAL WAVELENGTH HOLOGRAPHIC INTERFEROMETRY SYSTEM Patent

WILLIAM K. WITHEROW, inventor (to NASA) and ANDREAS ECKER, inventor (to NASA) (European Space Agency, Paris, France) 29 Jan. 1988 5 p Filed 29 Jan. 1988 (NASA-CASE-MFS-28242-1; US-PATENT-4,810,094; US-PATENT-APPL-SN-149822; US-PATENT-CLASS-356-347; US-PATENT-CLASS-356-361) Avail: US Patent and Trademark Office CSCL 14B

A two-wave holographic interferometry system and method is described. In such systems, a reference beam holographic is superimposed on an object beam, the object beam being an image obtained by passing a beam through an object regarding which some parameter (e.g., temperature gradient) is to be measured. A photograph of the superimposed beams is taken. This invention employs two object and two reference beams and the invention is particularly concerned with the use of a prism assembly which causes the two different wavelengths of the object beams to emerge from the prism at slightly different angles, thereby providing two holographic images which are slightly displaced from each other.

Official Gazette of the U.S. Patent and Trademark Office



N89-28793*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

HOLLOW FIBER CLINOSTAT: TECHNICAL ABSTRACT Patent Application

PERCY H. RHODES, inventor (to NASA), TERESA Y. MILLER,

inventor (to NASA), and ROBERT S. SNYDER, inventor (to NASA) 28 Jul. 1989 13 p (NASA-CASE-MFS-28370-1; NAS 1.71:MFS-28370-1; US-PATENT-APPL-SN-386175) Avail: NTIS HC A03/MF A01 CSCL 14B

A clinostat for simulating microgravity on cell systems carried in a fiber fixedly mounted in a rotatable culture vessel is disclosed. The clinostat is rotated horizontally along its longitudinal axis to simulate microgravity or vertically as a control response. Cells are injected into the fiber and the ends of the fiber are sealed and secured to spaced end pieces of a fiber holder assembly which consists of the end pieces, a hollow fiber, a culture vessel, and a tension spring with three alignment pins. The tension spring is positioned around the culture vessel with its ends abutting the end pieces for alignment of the spring. After the fiber is secured, the spring is decompressed to maintain tension on the fiber while it is being rotated. This assures that the fiber remains aligned along the axis of rotation. The fiber assembly is placed in the culture vessel and culture medium is added. The culture vessel is then inserted into the rotatable portion of the clinostat and subjected to rotate at selected rpms. The internal diameter of the hollow fiber determines the distance the cells are from the axis of rotation.

NASA

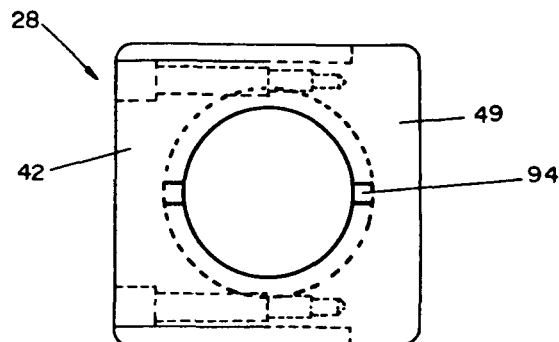


FIG. 4

N89-28794*# National Aeronautics and Space Administration. Pasadena Office, CA.

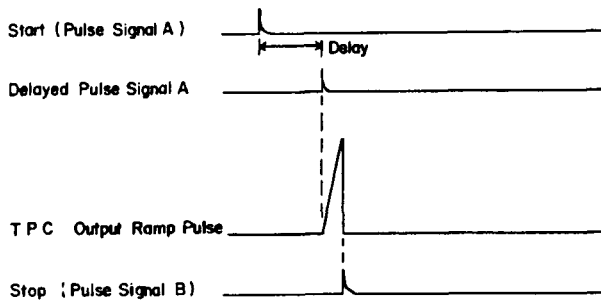
APPARATUS AND METHOD FOR CHARACTERIZING THE TRANSMISSION EFFICIENCY OF A MASS SPECTROMETER Patent Application

SANTASH SRIVASAYAVA, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 26 May 1989 19 p (Contract NAS7-918) (NASA-CASE-NPO-16989-1-CU; NAS 1.71:NPO-16989-1-CU; US-PATENT-APPL-SN-358027) Avail: NTIS HC A03/MF A01 CSCL 14B

An electron/ion coincidence technique is employed to characterize the absolute mass dependent transmission efficiency of mass spectrometers. The technique is not dependent upon the partial pressure of the sample beam or the ionization cross sections

of calibrant gases.

NASA



N89-28795*# National Aeronautics and Space Administration. Pasadena Office, CA.

REVERSAL ELECTRON ATTACHMENT IONIZER FOR DETECTION OF TRACE SPECIES Patent Application

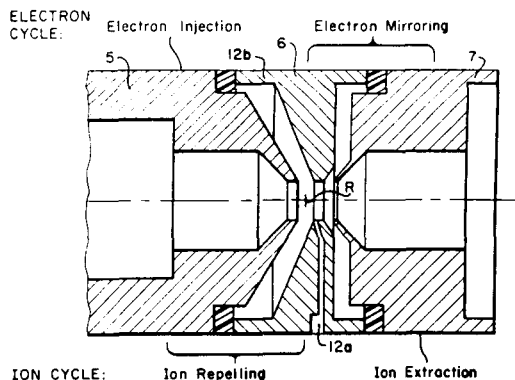
MARK T. BERNIUS, inventor (to NASA) and ARA CHUTJIAN, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 5 Jun. 1989 34 p

(Contract NAS7-918)

(NASA-CASE-NPO-17596-1-CU; NAS 1.71:NPO-17596-1-CU; US-PATENT-APPL-SN-361531) Avail: NTIS HC A03/MF A01 CSCL 14B

An in-line reversal electron, high-current ionizer capable of focusing a beam of electrons to a reversal region and executing a reversal of the electrons, such that the electrons possess zero kinetic energy at the point of reversal, may be used to produce both negative and positive ions. A sample gas is introduced at the point of electron reversal for low energy electron-(sample gas) molecule attachment with high efficiency. The attachment process produces negative ions from the sample gas, which includes species present in trace (minute) amounts. These ions are extracted efficiently and directed to a mass analyzer where they may be detected and identified. The generation and detection of positive ions is accomplished in a similar fashion with minimal adjustment to potentials applied to the apparatus.

NASA



N89-28796*# National Aeronautics and Space Administration. Pasadena Office, CA.

FIELD INDUCED GAP INFRARED DETECTOR Patent Application

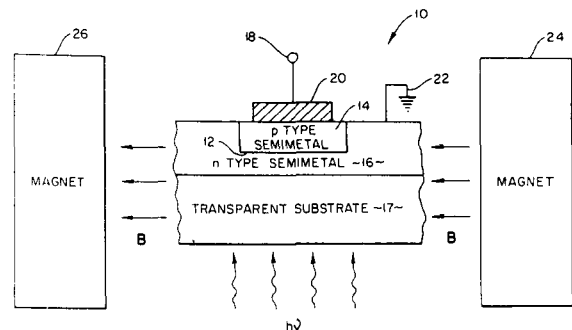
C. THOMAS ELLIOTT, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 21 Jun. 1989 27 p (Contract NAS7-918)

(NASA-CASE-NPO-17526-1-CU; NAS 1.71:NPO-17526-1-CU;

US-PATENT-APPL-SN-369403) Avail: NTIS HC A03/MF A01 CSCL 14B

A tunable infrared detector which employs a vanishing band gap semi-metal material provided with an induced band gap by a magnetic field to allow intrinsic semiconductor type infrared detection capabilities is disclosed. The semi-metal material may thus operate as a semiconductor type detector with a wavelength sensitivity corresponding to the induced band gap in a preferred embodiment of a diode structure. Preferred semi-metal materials include $\text{Hg}(1-x)\text{Cd}(x)\text{Te}$, x is less than 0.15, HgCdSe , BiSb , $\alpha\text{-Sn}$, HgMgTe , HgMnTe , HgZnTe , HgMnSe , HgMgSe , and HgZnSe . The magnetic field induces a band gap in the semi-metal material proportional to the strength of the magnetic field allowing tunable detection cutoff wavelengths. For an applied magnetic field from 5 to 10 tesla, the wavelength detection cutoff will be in the range of 20 to 50 micrometers for $\text{Hg}(1-x)\text{Cd}(x)\text{Te}$ alloys with x about 0.15. A similar approach may also be employed to generate infrared energy in a desired band gap and then operating the structure in a light emitting diode or semiconductor laser type of configuration.

NASA



N89-28806*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

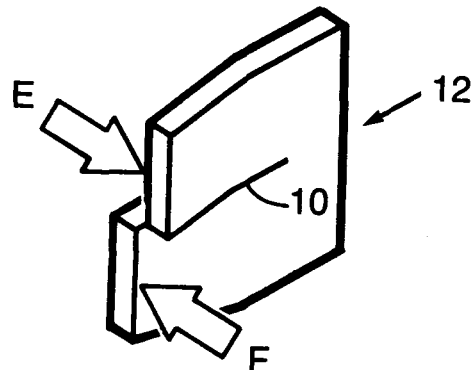
FATIGUE TESTING APPARATUS Patent Application

ROBERT J. BUZZARD, inventor (to NASA) 21 Aug. 1989 14 p

(NASA-CASE-LEW-14124-1; NAS 1.71:LEW-14124-1; US-PATENT-APPL-SN-396263) Avail: NTIS HC A03/MF A01 CSCL 14B

An apparatus is provided for obtaining a single crack in fatigue loading which emanates from a predetermined starting notch in a test specimen. This crack propagates in a direction in line with that of the applied Mode 2 load. The loading may be performed either monotonically or in a cyclic fatigue.

NASA



LASERS AND MASERS

Includes parametric amplifiers.

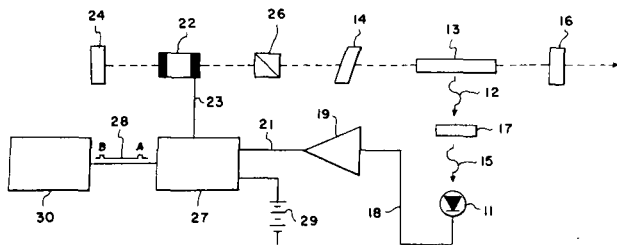
N89-28816*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

METHOD AND CIRCUIT FOR CONTROLLING THE EVOLUTION TIME INTERVAL OF A LASER OUTPUT PULSE Patent Application

Application
NORMAN P. BARNES, inventor (to NASA) 31 May 1989 13 p (NASA-CASE-LAR-13772-1; NAS 1.71:LAR-13772-1; US-PATENT-APPL-SN-359460) Avail: NTIS HC A03/MF A01 CSDL 20E

The invention is a method and circuit for controlling the evolution time interval of a laser output pulse used for making precise spectral measurements. It comprises the means for pumping a laser medium in a resonator that includes a Q-switch and polarizer that act in combination to control the loss in the resonator. A photodiode senses the resulting fluorescence which is applied to a two level Q-switch and polarizer from high to intermediate to substantially zero loss states to control the evolution time interval of the resulting laser output pulse.

NASA



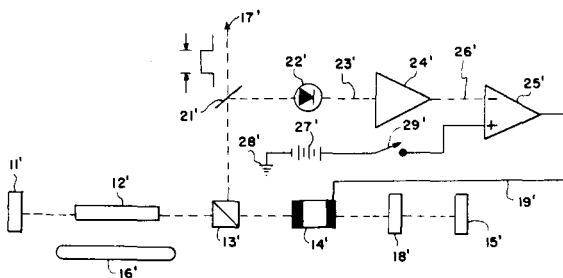
N89-28817*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

METHOD AND CIRCUIT FOR SHAPING LASER OUTPUT PULSES Patent Application

Application
NORMAN P. BARNES, inventor (to NASA) 31 May 1989 9 p (NASA-CASE-LAR-14203-1; NAS 1.71:LAR-14203-1; US-PATENT-APPL-SN-359459) Avail: NTIS HC A02/MF A01 CSDL 20E

The invention is a method and circuit for shaping laser output pulses from a laser resonator. A Q-switch and polarizer act in combination to control the loss to the resonator and provide the laser output representative of such loss. An optical diode senses the level of the output pulse and provides an output signal that when amplified is used to control voltage from a supply to provide a control signal which is applied to the Q-switch to control the shape of the output pulse by adjusting its length.

NASA



MECHANICAL ENGINEERING

Includes auxiliary systems (nonpower); machine elements and processes; and mechanical equipment.

N89-23880*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

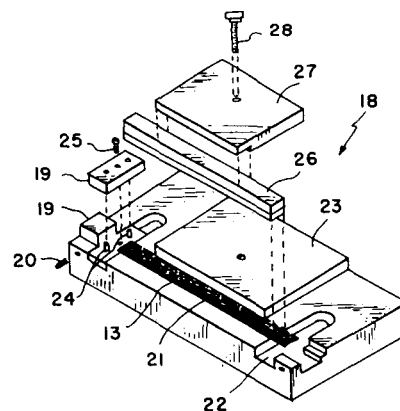
TENSILE FILM CLAMPS AND MOUNTING BLOCK FOR THE RHEOVIBRON AND AUTOVIBRON VISCOELASTOMETER Patent Application

Patent Application
DIANE M. STOKLEY, inventor (to NASA), ANNE K. STCLAIR, inventor (to NASA), and BRUCE D. LITTLE, inventor (to NASA) 4 Nov. 1988 17 p Sponsored by NASA. Langley Research Center

(NASA-CASE-LAR-13696-1; NAS 1.71:LAR-13696-1; US-PATENT-APPL-SN-267146) Avail: NTIS HC A03/MF A01 CSDL 13I

A set of film clamps and a mounting block for use in the determination of tensile modulus and damping properties of films in a manually operated or automated Rheovibron is diagrammed. These clamps and mounting block provide uniformity of sample gripping and alignment in the instrument. Operator dependence and data variability are greatly reduced.

NASA



N89-28829*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

VIBRATION ANALYZER Patent Application

Application
RICHARD J. BOZEMAN, JR., inventor (to NASA) 31 Jan. 1989 17 p

(NASA-CASE-MS-21408-1; NAS 1.71:MSC-21408-1; US-PATENT-APPL-SN-304154) Avail: NTIS HC A03/MF A01 CSDL 13I

The invention relates to monitoring circuitry for the real time detection of vibrations of a predetermined frequency and which are greater than a predetermined magnitude. The circuitry produces an instability signal in response to such detection. The circuitry is particularly adapted for detecting instabilities in rocket thrusters, but may find application with other machines such as expensive rotating machinery, or turbines. The monitoring circuitry identifies when vibration signals are present having a predetermined frequency of a multi-frequency vibration signal which has an RMS energy level greater than a predetermined magnitude. It generates an instability signal only if such a vibration signal is identified. The circuitry includes a delay circuit which responds with an alarm signal only if the instability signal continues for a predetermined time period. When used with a rocket thruster, the alarm signal may be used to cut off the thruster if such thruster is being used

in flight. If the circuitry is monitoring tests of the thruster, it generates signals to change the thruster operation, for example, from pulse mode to continuous firing to determine if the instability of the thruster is sustained once it is detected.

NASA

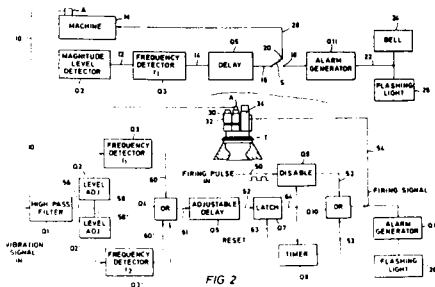


FIG 2

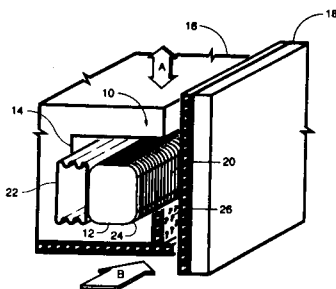
N89-28830*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

HIGH TEMPERATURE FLEXIBLE SEAL Patent Application

BRUCE M. STEINETZ, inventor (to NASA) and PAUL J. SIROCKY, inventor (to NASA) 30 Dec. 1988 14 p
(NASA-CASE-LEW-14695-1; NAS 1.71:LEW-14695-1;
US-PATENT-APPL-SN-292146) Avail: NTIS HC A03/MF A01
CSCL 11A

This device is concerned with sealing the sliding interfaces between structural panels that are roughly perpendicular to each other or whose edges are butted against one another. The gap which the seal element must seal in not uniform along the seal length requiring significant seal flexibility. The seal is mounted in a rectangular groove in a moveable structural panel. The seal comprises a plurality of rectangular shaped wafers stacked next to one another and preloaded in the axial direction to minimize leakage between wafers. The wafers are laterally preloaded to maintain sealing contact along the wafer faces which engage the adjacent wall of a sidewall using one of several approaches, such as the pressurized linear bellows. The seal accommodates distortions in the adjacent panel by relative sliding between adjacent wafers. Leakage between wafers is further minimized with good wafer surface finishes. Leakage between the seal nose and the adjacent structural panel is minimized when sealing against a distorted sidewall with relatively thin wafers and suitable seal preload apparatus. Leakage behind the seal is minimized with good groove tolerances and good sealing contact between the preload system and the back of the peripheral edge of the wafers.

NASA

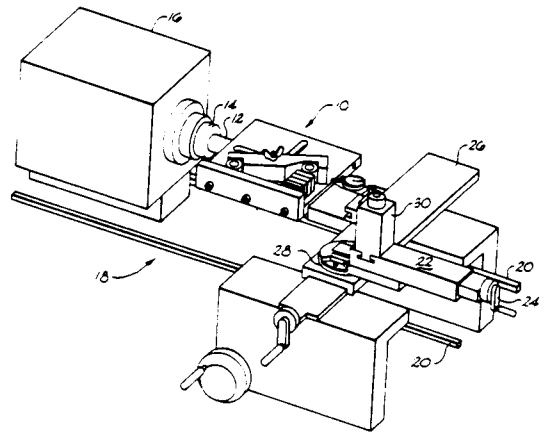


N89-28831* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
UNIVERSAL PRECISION SINE BAR ATTACHMENT Patent
FRANKLIN D. MANN, inventor (to NASA) 7 Mar. 1989 9 p
Filed 9 Mar. 1988 Supersedes N88-24971 (26 - 18, p 2523

(NASA-CASE-MFS-28253-1; US-PATENT-4,809,441;
US-PATENT-APPL-SN-165943; US-PATENT-CLASS-33-536)
Avail: U.S. Patent and Trademark Office CSCL 13I

This invention relates to an attachment for a sine bar which can be used to perform measurements during lathe operations or other types of machining operations. The attachment can be used for setting precision angles on vises, dividing heads, rotary tables and angle plates. It can also be used in the inspection of machined parts, when close tolerances are required, and in the layout of precision hardware. The novelty of the invention is believed to reside in a specific versatile sine bar attachment for measuring a variety of angles on a number of different types of equipment.

Official Gazette of the U.S. Patent and Trademark Office



N89-28841*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

TURBOMACHINERY ROTOR SUPPORT WITH DAMPING

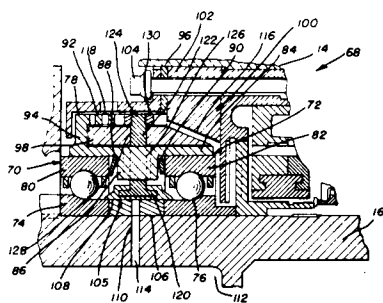
Patent Application

GEORGE L. VONPRAGENAU, inventor (to NASA) 26 May 1989
19 p
(NASA-CASE-MFS-28345-1; NAS 1.71:MFS-28345-1;
US-PATENT-APPL-SN-364743) Avail: NTIS HC A03/MF A01
CSCL 13I

Damping seals, damping bearings, and a support sleeve are presented for the ball bearings of a high speed rotor. The ball bearings consist of a duplex set having the outer races packaged tightly within the sleeve while the sleeve provides a gap with a support member so that the bearings may float with the sleeve. The sleeve has a web extending radially between the pair of out races and acts in conjunction with one or more springs to apply an axial preload to the outer races. The sleeves have a series of slits which provide the sleeve with a spring-like quality so that the spring acts to center the rotor upon which the bearings are mounted during start up and shut down. A damping seal or a damping bearing may be used in conjunction with the ball bearings and supporting sleeve, the damping seal and damping bearing having rotor portions including rigid outer surfaces mounted within the bore of a stator portion having triangular shaped pockets on the surface facing the rotor. Axial gates are provided between adjacent pockets in sections of the stator permitting fluid to flow with less resistance axially relative to the flow of fluids circumferentially

between the rotor and the stator.

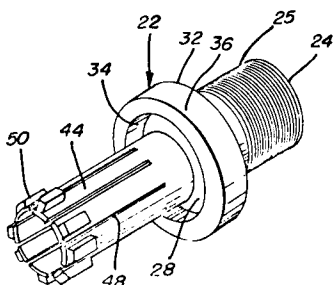
NASA



N89-28842*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
TURBOMACHINERY SHAFT INSERT Patent Application
 GEORGE L. VONPRAGNAU, inventor (to NASA) 26 May 1989 12 p
 (NASA-CASE-MFS-28345-2; NAS 1.71:MFS-28345-2; US-PATENT-APPL-SN-358028) Avail: NTIS HC A03/MF A01 CSDL 131

An insert is presented for a hollow rotatable shaft on the end of which an impeller is mounted, the insert having a first cylindrical portion receivable within the end of the shaft. The insert includes a radially extending portion adjacent the end of the shaft having an annular wall including radially inner and outer surfaces for engaging tightly similar surfaces in a recess formed in the impeller to provide inner and outer pilot surfaces. The insert also includes a tubular extension which is received within a bore in the impeller, the tubular extension having spaced longitudinally extending slits for permitting the extension together with radially extending hook-like tongues thereon to be received within radial slots in the bore of the impeller to lock the impeller to the insert.

NASA

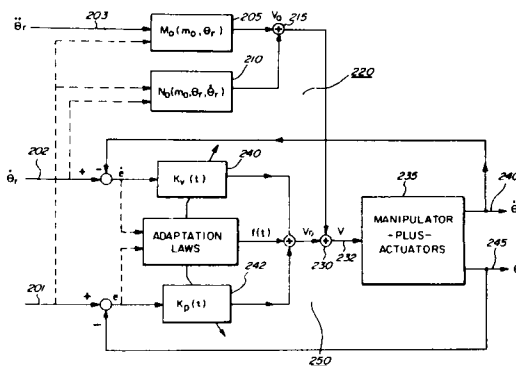


N89-28846*# National Aeronautics and Space Administration. Pasadena Office, CA.
ROBUST HIGH-PERFORMANCE CONTROL FOR ROBOTIC MANIPULATORS Patent Application
 HOMAYOUN SERAJI, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 17 May 1989 60 p
 (NASA-CASE-NPO-17785-1-CU; NAS 1.71:NPO-17785-1-CU; US-PATENT-APPL-SN-353411) Avail: NTIS HC A04/MF A01 CSDL 131

Model-based and performance-based control techniques are combined for an electrical robotic control system. Thus, two distinct and separate design philosophies were merged into a single control system having a control law formulation including two distinct and separate components, each of which yields a respective signal component that is combined into a total command signal for the system. Those two separate system components include a feedforward controller and feedback controller. The feedforward controller is model-based and contains any known part of the

manipulator dynamics that can be used for on-line control to produce a nominal feedforward component of the system's control signal. The feedback controller is performance-based and consists of a simple adaptive PID controller which generates an adaptive control signal to complement the nominal feedforward signal.

NASA



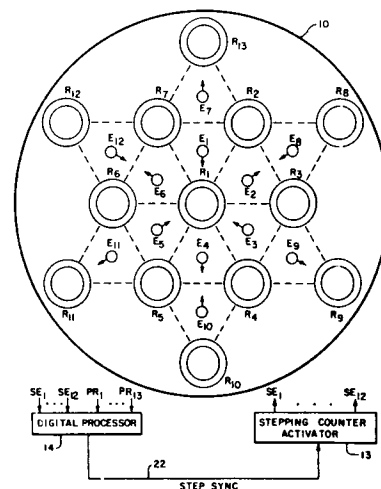
N89-29750*# National Aeronautics and Space Administration. Pasadena Office, CA.

DISTRIBUTED PROXIMITY SENSOR SYSTEM Patent Application

SUKHAN LEE, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 30 Dec. 1988 22 p
 (Contract NAS7-918)
 (NASA-CASE-NPO-17275-1-CU; NAS 1.71:NPO-17275-1-CU; US-PATENT-APPL-SN-292047) Avail: NTIS HC A03/MF A01 CSDL 131

The invention relates to sensors embedded on the surface of a robot hand, or other moving member. By distributing proximity sensors capable of detecting distances and angles to points on the surface of an object, information is obtained for achieving noncontacting shape and distance perception, i.e., for automatic determination of the object's shape, direction, and distance, as well as the orientation of the object relative to the robot hand or other moving member.

NASA



45

ENVIRONMENT POLLUTION

Includes atmospheric, noise, thermal, and water pollution.

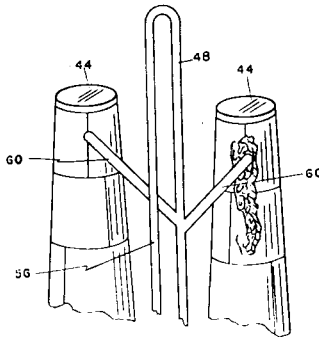
N89-28967*# National Aeronautics and Space Administration.
John C. Stennis Space Center, Bay Saint Louis, MS.

A COMBINED AIR AND WATER POLLUTION CONTROL SYSTEM Patent Application

BILLY C. WOLVERTON, inventor (to NASA) and LAMONT JARRELL, inventor (to NASA) 26 May 1989 15 p
(NASA-CASE-NST-00007-1; NAS 1.71:NST-00007-1;
US-PATENT-APPL-SN-357938) Avail: NTIS HC A03/MF A01
CSCL 13B

A bioaquatic air pollution control system for controlling both water and atmospheric pollution is disclosed. The pollution control system includes an exhaust for directing polluted gases out of a furnace and a fluid circulating system which circulates fluid, such as waste water, from a source, past the furnace where the fluid flow entrains the pollutants from the furnace. The combined fluid and pollutants are then directed through a rock/plant/microbial filtering system. A suction pump pumps the treated waste water from the filter system past the exhaust to again entrain more pollutants from the furnace where they are combined with the fluid (waste water) and directed to the filter system.

NASA



51

LIFE SCIENCES (GENERAL)

N89-25557*# National Aeronautics and Space Administration.
Lyndon B. Johnson Space Center, Houston, TX.

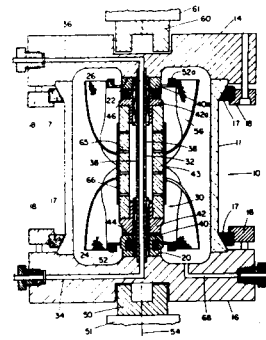
SPIRAL VANE BIOREACTOR Patent Application

DENNIS R. MORRISON, inventor (to NASA) 29 Nov. 1988
30 p Sponsored by NASA. Johnson Space Center
(NASA-CASE-MSC-21361-1; NAS 1.71:MSC-21361-1;
US-PATENT-APPL-SN-278137) Avail: NTIS HC A03/MF A01
CSCL 06C

A spiral vane bioreactor of a perfusion type is described in which a vertical chamber, intended for use in a microgravity condition, has a central rotating filter assembly and has flexible membranes disposed to rotate annularly about the filter assembly. The flexible members have end portions disposed angularly with respect to one another. A fluid replenishment medium is input from a closed loop liquid system to a completely liquid filled chamber containing microcarrier beads, cells and a fluid medium. Output of spent medium is to the closed loop. In the closed loop, the output and input parameters are sensed by sensors. A manifold permits recharging of the nutrients and pH adjustment. Oxygen is

supplied and carbon dioxide and bubbles are removed and the system is monitored and controlled by a microprocessor.

NASA



54

MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

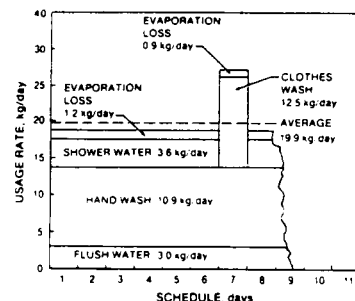
N89-29027*# National Aeronautics and Space Administration.
Lyndon B. Johnson Space Center, Houston, TX.

METHOD AND APPARATUS FOR BIO-REGENERATIVE LIFE SUPPORT SYSTEM Patent Application

HATICE S. CULLINGFORD, inventor (to NASA) 11 Jul. 1989
34 p
(NASA-CASE-MSC-21629-1; NAS 1.71:MSC-21629-1;
US-PATENT-APPL-SN-378548) Avail: NTIS HC A03/MF A01
CSCL 06K

A life support system is disclosed for human habitation (cabin) which has a bioregenerative capability through the use of a plant habitat (greenhouse) whereby oxygen-rich air from the greenhouse is processed and used in the cabin and carbon dioxide-rich air from the cabin is used in the greenhouse. Moisture from the air of both cabin and greenhouse is processed and reused in both. Wash water from the cabin is processed and reused in the cabin as hygiene water, and urine from the cabin is processed and used in the greenhouse. Spent water from the greenhouse is processed and reused in the greenhouse. Portions of the processing cycles are separated between cabin and greenhouse in order to reduce to a minimum cross contamination of the two habitat systems. Other portions of the processing cycles are common to both cabin and greenhouse. The use of bioregenerative techniques permits a substantial reduction of the total consumables used by the life support system.

NASA



N89-29953* National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, FL.

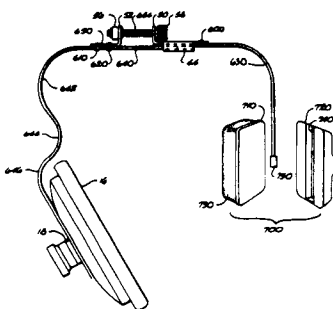
MULTI-ADJUSTABLE HEADBAND Patent

PIERCE C. TOOLE, inventor (to NASA), HOWARD E. CHALSON, inventor (to NASA), and WALTER S. BUSSEY, inventor (to NASA) (Planning Research Corp., Kennedy Space Center, FL.) 8 Nov. 1988 11 p Filed 8 Aug. 1986 Supersedes N87-25765 (25 - 19 p 2646)

(NASA-CASE-KSC-11322-1; US-PATENT-4,783,822; US-PATENT-APPL-SN-894541; US-PATENT-CLASS-381-187; US-PATENT-CLASS-2-201; US-PATENT-CLASS-24-68B; US-PATENT-CLASS-381-183) Avail: U.S. Patent and Trademark Office CSCL 05H

This invention relates to a headband for a headset having separate coarse and fine adjustment features. The adjustments may be to the axial distance between at least one earpiece element and a side support. Such adjustment to the axial distance varies the pressure exerted on the head of the user. The present fine adjustment feature may be used while the headset is being worn, thereby permitting a user to optimize the amount of pressure between the contending criteria of comfort and keeping the headset in place on the user's head.

Official Gazette of the U.S. Patent and Trademark Office



60

COMPUTER OPERATIONS AND HARDWARE

Includes hardware for computer graphics, firmware, and data processing.

N89-26400* National Aeronautics and Space Administration. Pasadena Office, CA.

PROGRAMMABLE PIPELINED IMAGE PROCESSOR Patent

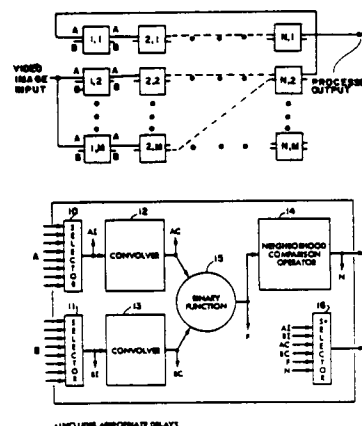
DONALD B. GENNERY, inventor (to NASA) and BRIAN WILCOX, inventor (to NASA) 6 Dec. 1988 13 p Filed 31 Dec. 1985 Supersedes N86-23283 (24-13, p 2183) (Contract NAS7-918)

(NASA-CASE-NPO-16461-1CU; US-PATENT-4,790,026; US-PATENT-APPL-SN-815103; US-PATENT-CLASS-382-49; US-PATENT-CLASS-382-41; US-PATENT-CLASS-382-42; US-PATENT-CLASS-364-131) Avail: U.S. Patent and Trademark Office CSCL 09B

A pipelined image processor selectively interconnects modules in a column of a two-dimensional array to modules of the next column of the array of modules 1,1 through M,N, where M is the number of modules in one dimension and N is the number of modules in the other direction. Each module includes two input selectors for A and B inputs, two convolvers, a binary function operator, a neighborhood comparison operator which produces an A output and an output selector which may select as a B output the output of any one of the components in the module, including the A output of the neighborhood comparison operator. Each module may be connected to as many as eight modules in the next column, preferably with the majority always in a different

row that is up (or down) in the array for a generally spiral data path around the torus thus formed. The binary function operator is implemented as a look-up table addressed by the most significant 8 bits of each 12-bit argument. The table output includes a function value and the slopes for interpolation of the two arguments by multiplying the 4 least significant bits in multipliers and adding the products to the function value through adders.

Official Gazette of the U.S. Patent and Trademark Office



N89-29955*# National Aeronautics and Space Administration. Pasadena Office, CA.

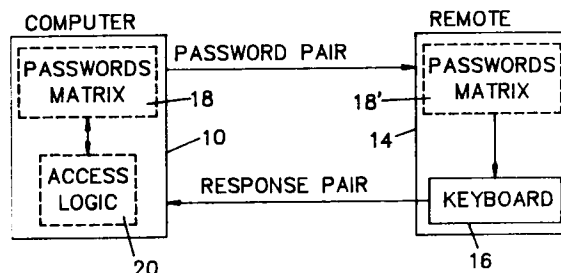
COMPUTER ACCESS SECURITY CODE SYSTEM Patent Application

EARL R. COLLINS, JR., inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 5 Dec. 1988 16 p (Contract NAS7-918)

(NASA-CASE-NPO-17525-1-CU; NAS 1.71:NPO-17525-1-CU; US-PATENT-APPL-SN-279630) Avail: NTIS HC A03/MF A01 CSCL 09B

A security code system is disclosed for controlling access to computers and computer controlled entry situations. It is comprised of a plurality of subsets of alpha-numeric characters disposed in random order in matrices of at least two dimensions forming theoretical rectangles, or cubes, such that when access is denied, at least one pair of previously unused character subsets not found in the same row or column of the matrix is chosen at random and transmitted by the computer. The proper response to gain access is transmittal of subsets which complete the rectangle, and/or a parallelepiped whose opposite corners were defined by the first groups of the code. Once used, subsets are not used again to absolutely defeat unauthorized access by eavesdropping, and the like.

NASA



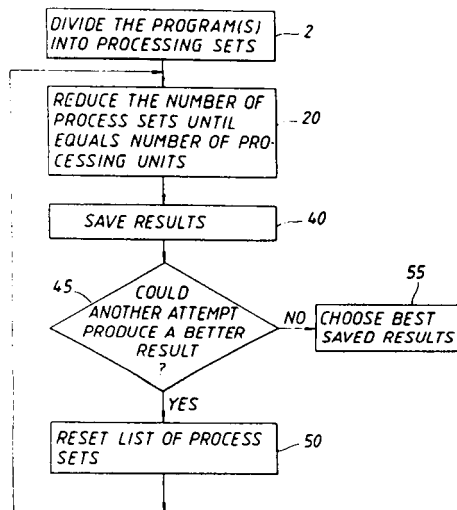
COMPUTER SYSTEMS

Includes computer networks and special application computer systems.

N89-24084*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
A METHOD OF UP-FRONT LOAD BALANCING FOR LOCAL MEMORY PARALLEL PROCESSORS Patent Application
 PAUL THOMAS BAFFES, inventor (to NASA) 12 Dec. 1988
 29 p Sponsored by NASA. Johnson Space Center
 (NASA-CASE-MSC-21348-1; NAS 1.71:MSC-21348-1;
 US-PATENT-APPL-SN-283106) Avail: NTIS HC A03/MF A01
 CSCL 09B

In a parallel processing computer system with multiple processing units and shared memory, a method is disclosed for uniformly balancing the aggregate computational load in, and utilizing minimal memory by, a network having identical computations to be executed at each connection therein. Read-only and read-write memory are subdivided into a plurality of process sets, which function like artificial processing units. Said plurality of process sets is iteratively merged and reduced to the number of processing units without exceeding the balance load. Said merger is based upon the value of a partition threshold, which is a measure of the memory utilization. The turnaround time and memory savings of the instant method are functions of the number of processing units available and the number of partitions into which the memory is subdivided. Typical results of the preferred embodiment yielded memory savings of from sixty to seventy five percent.

NASA



N89-29976*# National Aeronautics and Space Administration. Pasadena Office, CA.

DYNAMIC RESOURCE ALLOCATION SCHEME FOR DISTRIBUTED HETEROGENEOUS COMPUTER SYSTEMS
Patent Application

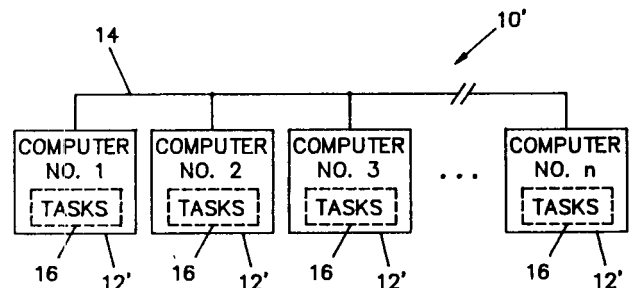
HOWARD T. LIU, inventor (to NASA) and JOHN A. SILVESTER, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 30 Dec. 1988 25 p
 (Contract NAS7-918)

(NASA-CASE-NPO-17197-1-CU; NAS 1.71:NPO-17197-1-CU;
 US-PATENT-APPL-SN-292124) Avail: NTIS HC A03/MF A01
 CSCL 09B

This invention relates to a resource allocation in computer systems, and more particularly, to a method and associated apparatus for shortening response time and improving efficiency of a heterogeneous distributed networked computer system by reallocating the jobs queued up for busy nodes to idle, or less-busy

nodes. In accordance with the algorithm (SIDA for short), the load-sharing is initiated by the server device in a manner such that extra overhead is not imposed on the system during heavily-loaded conditions. The algorithm employed in the present invention uses a dual-mode, server-initiated approach. Jobs are transferred from heavily burdened nodes (i.e., over a high threshold limit) to low burdened nodes at the initiation of the receiving node when: (1) a job finishes at a node which is burdened below a pre-established threshold level, or (2) a node is idle for a period of time as established by a wakeup timer at the node. The invention uses a combination of the local queue length and the local service rate ratio at each node as the workload indicator.

NASA



ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure, electron properties, and molecular spectra.

N89-29169* National Aeronautics and Space Administration. Pasadena Office, CA.

TROCHOIDAL ANALYSIS OF SCATTERED ELECTRONS IN A MERGED ELECTRON-ION BEAM GEOMETRY Patent

ARA CHUTJIAN, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 4 Apr. 1989 10 p Filed 11 Feb. 1988 Supersedes N88-25281 (26 - 18, p 2573)
 (Contract NAS7-918)

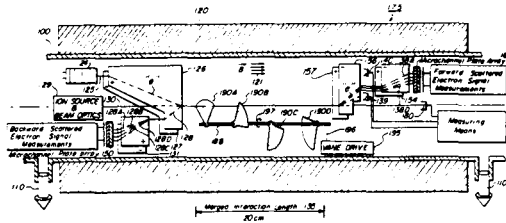
(NASA-CASE-NPO-16789-1-CU; US-PATENT-4,818,868;
 US-PATENT-APPL-SN-154713; US-PATENT-CLASS-250-252;
 US-PATENT-CLASS-250-397) Avail: U.S. Patent and Trademark Office CSCL 20H

The method and apparatus of this invention provides a plurality of measurements indicative of the absolute cross section for excitation of an ion beam. The ion beam is merged for excitation by specific energies of electrons in an electron beam. Both beams are merged in an evacuated enclosure having a longitudinal magnetic field and a crossed uniform electric field. The ions and electrons interact over a known merged longitudinal length in a merged beam area. After collision, the electron and ion beams are demerged. Forward and backward-scattered electrons are collected and position-detected by a pair of microchannel plate arrays located at opposite ends of said longitudinal beam-merging area. A series of electron and ion primary current measurements are taken at full ion and electron beam strength. Measurements are also taken at greatly reduced beam strength to obtain a beam

74 OPTICS

overlap profile.

Official Gazette of the U.S. Patent and Trademark Office



74

OPTICS

Includes light phenomena; and optical devices.

N89-24153*# National Aeronautics and Space Administration. Pasadena Office, CA.

A COMPACT FAST WIDE ANGLE BROAD BAND SPECTROMETER OPTICAL SYSTEM Patent Application

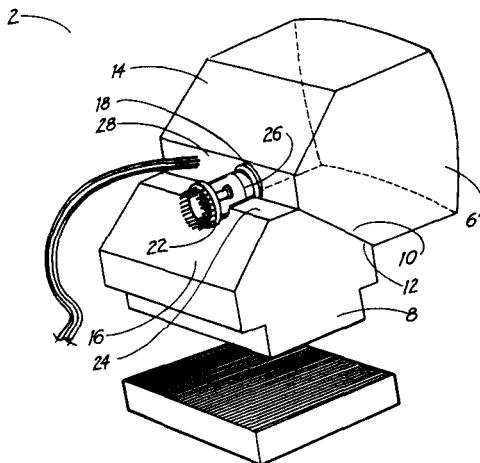
NORMAN A. PAGE, inventor (to NASA) and MARY L. WHITE, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 29 Nov. 1988 13 p

(Contract NAS7-918)

(NASA-CASE-NPO-17562-1-CU; NAS 1.71:NPO-17562-1-CU; US-PATENT-APPL-SN-277596) Avail: NTIS HC A03/MF A01 CSCL 20F

An improved spectrometer particularly adapted for the infrared range includes a solid glass optical system for implementing a double pass arrangement. A pair of optical elements can be joined along one optical cemented surface to function both as a collimator and a camera in an extremely compact configuration. As a result, a high numerical aperture wide field of view and broad spectral range spectrometer is achieved.

NASA



N89-25689* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

OPTICAL PRESSURE SEALING COUPLING APPARATUS Patent

TIMOTHY B. IRVIN, inventor (to NASA) and RICHARD E. FRENCH,

inventor (to NASA) 17 Jan. 1989 6 p Filed 16 Feb. 1988 Supersedes N88-25303 (26-18, p 2576)

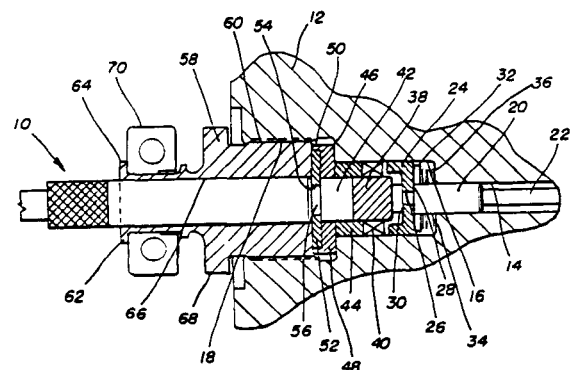
(NASA-CASE-MFS-29348-1; US-PATENT-4,798,433;

US-PATENT-APPL-SN-156518; US-PATENT-CLASS-350-96.21;

US-PATENT-CLASS-350-96.25) Avail: U.S. Patent and Trademark Office CSCL 20F

An apparatus is presented for optically coupling and pressure sealing sections of an instrument probe, one of the section being at a high pressure cryogenic environment and the other section being at ambient pressure. The apparatus includes a housing having a passageway within which elements are mounted for precisely locating a rigid optical fiber coupler and the probe sections so as to optically connect and maintain the ends of the probe sections together to permit signals to pass in both directions through the joint in two or more discrete channels. An adjustable positioning member acts to connect the external section of the probe to the housing in axial and rotation alignment with the interior section.

Official Gazette of the U.S. Patent and Trademark Office



N89-29191*# National Aeronautics and Space Administration. Pasadena Office, CA.

FIBER OPTIC FREQUENCY TRANSFER LINK Patent Application

LORI PRIMAS, inventor (to NASA), RICHARD SYDNOR, inventor (to NASA), and GEORGE LUTES, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 31 May 1989 22 p

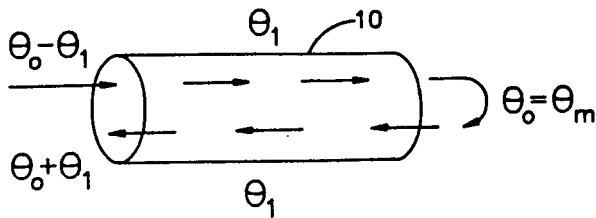
(Contract NAS7-918)

(NASA-CASE-NPO-17703-1-CU; NAS 1.71:NPO-17703-1-CU; US-PATENT-APPL-SN-359801) Avail: NTIS HC A03/MF A01 CSCL 20F

A reference frequency distribution system is disclosed for transmitting a reference frequency from a reference unit to a remote unit while keeping the reference frequency at the reference unit and the remote unit in phase. A fiber optic cable connects the reference unit to the remote unit. A frequency source at the reference unit produces a reference frequency having an adjustable phase. A fiber optic transmitter at the reference unit modulates a light beam with the reference frequency and transmits the light beam into the fiber optic cable. A 50/50 reflector at the remote unit reflects a first portion of the light beam from the reference unit back into the fiber optic cable to the reference unit. A first fiber optic receiver disposed at the remote unit receives a second portion of the light beam and demodulates the reference frequency to be used at the remote unit. A second fiber optic receiver disposed at the reference unit receives the first portion of the light beam and demodulates a reference frequency component. A phase conjugator is connected to the frequency source for comparing the phase of the reference frequency component to the phase of the reference frequency modulating the light beam being transmitted from the reference unit to maintain a conjugate (anti-symmetric) relationship between the reference frequency component and the reference frequency modulating the light beam where virtually no phase difference exists between the phase of the reference frequency component and the phase of the reference

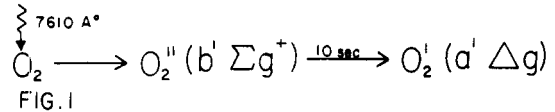
frequency modulating the light beam.

NASA



superconductor. The oxidation of the substrate is achieved through the use of an excited state of oxygen in contact with the said substrate. The apparatus includes a chamber for holding the substrate and means for providing oxygen in an excited state to the chamber and substrate.

NASA



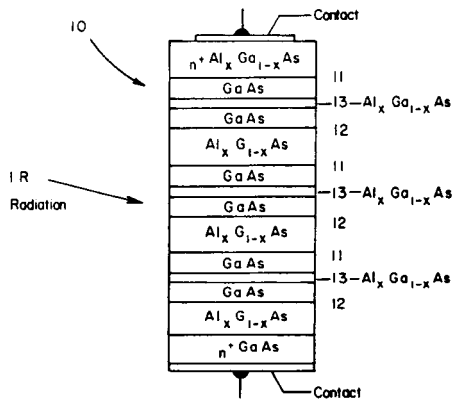
N89-30044*# National Aeronautics and Space Administration. Pasadena Office, CA.

LONG WAVELENGTH INFRARED DETECTOR Patent Application

Application
 RICHARD P. VASQUEZ, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 12 Dec. 1988 13 p
 (Contract NAS7-918)
 (NASA-CASE-NPO-17543-1-CU; NAS 1.71:NPO-17543-1-CU;
 US-PATENT-APPL-SN-283443) Avail: NTIS HC A03/MF A01
 CSCL 20F

Long wavelength infrared detection is achieved by a detector made with layers of quantum well material bounded on each side by barrier material to form paired quantum wells, each quantum well having a single energy level. The width and depth of the paired quantum wells, and the spacing between, are selected to split the single energy level with an upper energy level near the top of the energy wells. The spacing is selected for splitting the single energy level into two energy levels with a difference between levels sufficiently small for detection of infrared radiation of a desired wavelength.

NASA



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SOLID-STATE PHYSICS

Includes superconductivity.

N89-30076*# National Aeronautics and Space Administration. Pasadena Office, CA.

OXIDATION OF SEMICONDUCTORS AND SUPERCONDUCTORS Patent Application

RICHARD P. VASQUEZ, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 30 Dec. 1988 14 p
 (Contract NAS7-918)
 (NASA-CASE-NPO-17534-1-CU; NAS 1.71:NPO-17534-1-CU;
 US-PATENT-APPL-SN-292141) Avail: NTIS HC A03/MF A01
 CSCL 20L

A process and apparatus are disclosed for low temperature oxidation of a substrate such as a semiconductor or

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**NASA Case
Number
Prefix Letters**

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NASA Patent Counsel**

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PATENT LICENSING REGULATIONS

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

14 CFR Part 1245

Licensing of NASA Inventions

AGENCY: National Aeronautics and Space Administration

ACTION: Interim regulation with comments requested.

SUMMARY: The National Aeronautics and Space Administration (NASA) is revising its patent licensing regulations to conform with Pub. L. 96-517. This interim regulation provides policies and procedures applicable to the licensing of federally owned inventions in the custody of the National Aeronautics and Space Administration, and implements Pub. L. 96-517. The object of this subpart is to use the patent system to promote the utilization of inventions arising from NASA supported research and development.

EFFECTIVE DATE: July 1, 1981. Comments must be received in writing by December 2, 1981. Unless a notice is published in the **Federal Register** after the comment period indicating changes to be made, this interim regulation shall become a final regulation.

ADDRESS: Mr. John G. Mannix, Director of Patent Licensing, GP-4, NASA, Washington, D.C. 20546

FOR FURTHER INFORMATION CONTACT:

Mr. John G. Mannix, (202) 755-3954.

SUPPLEMENTARY INFORMATION:

PART 1245—PATENTS AND OTHER INTELLECTUAL PROPERTY RIGHTS

Subpart 2 of Part 1245 is revised to read as follows:

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Subpart 2—Licensing of NASA Inventions

Sec.

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1245.214 Confidentiality of information.

Authority: 35 U.S.C. Section 207 and 208.94 Stat 3023 and 3024.

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Subpart 2—Licensing of NASA Inventions

§ 1245.200 Scope of subpart.

This subpart prescribes the terms, conditions and procedures upon which a NASA invention may be licensed. It does not affect licenses which (a) were in effect prior to July 1, 1981; (b) may exist at the time of the Government's acquisition of title to the invention, including those resulting from the allocation of rights to inventions made under Government research and development contracts; (c) are the result of an authorized exchange of rights in the settlement of patent disputes; or (d) are otherwise authorized by law or treaty.

§ 1245.201 Policy and objective.

It is the policy and objective of this subpart to use the patent system to promote the utilization of inventions arising from NASA supported research and development.

§ 1245.202 Definitions

(a) "Federally owned invention" means an invention, plant, or design which is covered by a patent, or patent application in the United States, or a patent, patent application, plant variety protection, or other form of protection, in a foreign country, title to which has been assigned to or otherwise vested in the United States Government.

(b) "Federal agency" means an executive department, military department, Government corporation, or independent establishment, except the Tennessee Valley Authority, which has custody of a Federally owned invention.

(c) "NASA Invention" means a Federally owned invention with respect to which NASA maintains custody and administration, in whole or in part, of the right, title or interest in such invention on behalf of the United States Government.

(d) "Small business firm" means a small business concern as defined at section 2 of Pub. L. 85-536 (15 U.S.C. 632) and implementing regulations of the Administrator of the Small Business Administration. For the purpose of these regulations, the size standard for small business concerns involved in Government procurement, contained in 13 CFR 121.3-8, and in subcontracting, contained in 13 CFR 121.3-12, will be used.

(e) "Practical application" means to manufacture in the case of a composition or product, to practice in the case of a process or method, or to operate in the case of a machine or system; and, in each case, under such condition, as to establish that the invention is being utilized and that its benefits are to the extent permitted by law or Government regulations available to the public on reasonable terms.

(f) "United States" means the United States of America, its territories and possessions, the District of Columbia, and the Commonwealth of Puerto Rico.

§ 1245.203 Authority to grant licenses.

NASA inventions shall be made available for licensing as deemed appropriate in the public interest. NASA may grant nonexclusive, partially exclusive, or exclusive licenses thereto under this subpart on inventions in its custody.

Restrictions and Conditions

§ 1245.204 All licenses granted under this subpart.

(a) *Restrictions.* (1) A license may be granted only if the applicant has supplied NASA with a satisfactory plan for development or marketing of the invention, or both, and with information about the applicant's capability to fulfill the plan.

(2) A license granting rights to use or sell under a NASA invention in the United States shall normally be granted only to a licensee who agrees that any products embodying the invention or produced through the use of the invention will be manufactured substantially in the United States.

(b) *Conditions.* Licenses shall contain such terms and conditions as NASA determines are appropriate for the protection of the interests of the Federal Government and the public and are not in conflict with law or this subpart. The following terms and conditions apply to any license:

(1) The duration of the license shall be for a period specified in the license agreement, unless sooner terminated in accordance with this subpart.

(2) The license may be granted for all or less than all fields of use of the invention or in specified geographical areas, or both.

(3) The license may extend to subsidiaries of the licensee or other parties if provided for in the license but shall be nonassignable without approval of NASA, except to the successor of that part of the licensee's business to which the invention pertains.

(4) The license may provide the licensee the right to grant sublicenses under the license, subject to the approval of NASA. Each sublicense shall make reference to the license, including the rights retained by the Government, and a copy of such sublicense shall be furnished to NASA.

(5) The license shall require the licensee to carry out the plan for development or marketing of the invention, or both, to bring the invention to practical application within a period specified in the license, and to continue to make the benefits of the invention reasonably accessible to the public.

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(6) The license shall require the licensee to report periodically on the utilization or efforts at obtaining utilization that are being made by the licensee, with particular reference to the plan submitted.

(7) All licenses shall normally require royalties or other consideration.

(8) Where an agreement is obtained pursuant to § 1245.204(a)(2) that any products embodying the invention or produced through use of the invention will be manufactured substantially in the United States, the license shall recite such agreement.

(9) The license shall provide for the right of NASA to terminate the license, in whole or in part, if:

(i) NASA determines that the licensee is not executing the plan submitted with its request for a license and the licensee cannot otherwise demonstrate to the satisfaction of NASA that it has taken or can be expected to take within a reasonable time effective steps to achieve practical application of the invention;

(ii) NASA determines that such action is necessary to meet requirements for public use specified by Federal regulations issued after the date of the license and such requirements are not reasonably satisfied by the licensee;

(iii) The licensee has willfully made a false statement of or willfully omitted a material fact in the license application or in any report required by the license agreement; or

(iv) The licensee commits a substantial breach of a covenant or agreement contained in the license.

(10) The license may be modified or terminated, consistent with this subpart, upon mutual agreement of NASA and the licensee.

(11) Nothing relating to the grant of a license, nor the grant itself, shall be construed to confer upon any person any immunity from or defenses under the antitrust laws or from a charge of patent misuse, and the acquisition and use of rights pursuant to this subpart shall not be immunized from the operation of state or Federal law by reason of the source of the grant.

Types of Licenses

§ 1245.205 Nonexclusive licenses.

(a) *Availability of licenses.* Nonexclusive licenses may be granted under NASA inventions without publication of availability or notice of a prospective license.

(b) *Conditions.* In addition to the provisions of § 1245.204, the nonexclusive license may also provide that, after termination of a period specified in the license agreement, NASA may restrict the license to the fields of use or geographic areas, or both, in which the licensee has brought the invention to practical application and continues to make the benefits of the invention reasonably accessible to the public. However, such restriction shall be made only in order to grant an exclusive or partially exclusive license in accordance with this subpart.

§ 1245.206 Exclusive and partially exclusive licenses.

(a) Domestic licenses.

(1) *Availability of licenses.* Exclusive or partially exclusive licenses may be granted on NASA inventions: (i) 3 months after notice of the invention's availability has been announced in the **Federal Register**; or (ii) without such notice where NASA determines that expeditious granting of such a license will best serve the interests of the Federal Government and the public; and (iii) in either situation, specified in (a)(1)(i) or (ii) of this section only if:

(A) Notice of a prospective license, identifying the invention and the prospective licensee, has been published in the **Federal Register**, providing opportunity for filing written objections within a 60-day period;

(B) After expiration of the period in § 1245.206(a)(1)(iii)(A) and consideration of any written objections received during the period, NASA has determined that:

(1) The interests of the Federal Government and the public will best be served by the proposed license, in view of the applicant's intentions, plans, and ability to bring the invention to practical application or otherwise promote the invention's utilization by the public;

(2) The desired practical application has not been achieved, or is not likely expeditiously to be achieved, under any nonexclusive license which has been granted, or which may be granted, on the invention;

(3) Exclusive or partially exclusive licensing is a reasonable and necessary incentive to call forth the investment of risk capital and expenditures to bring the invention to practical application or otherwise promote the invention's utilization by the public; and

(4) The proposed terms and scope of exclusivity are not greater than reasonably necessary to provide the incentive for bringing the invention to practical application or otherwise promote the invention's utilization by the public;

(C) NASA has not determined that the grant of such license will tend substantially to lessen competition or result in undue concentration in any section of the country in any line of commerce to which the technology to be licensed relates, or to create or maintain other situations inconsistent with the antitrust laws; and

(D) NASA has given first preference to any small business firms submitting plans that are determined by the agency to be within the capabilities of the firms and as equally likely, if executed, to bring the invention to practical application as any plans submitted by applicants that are not small business firms.

(2) *Conditions.* In addition to the provisions of § 1245.204, the following terms and conditions apply to domestic exclusive and partially exclusive licenses:

(i) The license shall be subject to the irrevocable, royalty-free right of the Government of the United States to practice and have practiced the invention on behalf of the United States and on behalf of any foreign government or international organization pursuant to any existing or future treaty or agreement with the United States.

(ii) The license shall reserve to NASA the right to require the licensee to grant sublicenses to responsible applicants, on reasonable terms, when necessary to fulfill health or safety needs.

(iii) The license shall be subject to any licenses in force at the time of the grant of the exclusive or partially exclusive license.

(iv) The license may grant the licensee the right of enforcement of the licensed patent pursuant to the provisions of Chapter 29 of Title 35, United States Code, or other statutes, as determined appropriate in the public interest.

(b) Foreign licenses.

(1) *Availability of licenses.* Exclusive or partially exclusive licenses may be granted on a NASA invention covered by a foreign patent, patent application, or other form of protection, provided that:

(i) Notice of a prospective license, identifying the invention and prospective licensee, has been published in the **Federal Register**, providing opportunity for filing written objections within a 60-day period and following consideration of such objections;

(ii) NASA has considered whether the interests of the Federal Government or United States industry in foreign commerce will be enhanced; and

(iii) NASA has not determined that the grant of such license will tend substantially to lessen competition or result in undue concentration in any section of the United States in any line of commerce to which the technology to be licensed relates, or to create or maintain other situations inconsistent with antitrust laws.

(2) *Conditions.* In addition to the provisions of § 1245.204, the following terms and conditions apply to foreign exclusive and partially exclusive licenses:

(i) The license shall be subject to the irrevocable, royalty-free right of the Government of the United States to practice and have practiced the invention on behalf of the United States and on behalf of any foreign government or international organization pursuant to any existing or future treaty or agreement with the United States.

(ii) The license shall be subject to any licenses in force at the time of the grant of the exclusive or partially exclusive license.

(iii) The license may grant the licensee the right to take any suitable and necessary actions to protect the licensed property, on behalf of the Federal Government.

(c) *Record of determinations.* NASA shall maintain a record of determinations to grant exclusive or partially exclusive licenses.

Procedures

§ 1245.207 Application for a license.

An application for a license should be addressed to the Patent Counsel at the NASA installation having responsibility for the invention and shall normally include:

(a) Identification of the invention for which the license is desired, including the patent application serial number or patent number, title, and date, if known;

(b) Identification of the type of license for which the application is submitted;

(c) Name and address of the person, company, or organization applying for the license and the citizenship or place of incorporation of the applicant;

(d) Name, address, and telephone number of representative of applicant to whom correspondence should be sent;

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(e) Nature and type of applicant's business, identifying products or services which the applicant has successfully commercialized, and approximate number of applicant's employees;

(f) Source of information concerning the availability of a license on the invention;

(g) A statement indicating whether applicant is a small business firm as defined in § 1245.202(c);

(h) A detailed description of applicant's plan for development or marketing of the invention, or both, which should include:

(1) A statement of the time, nature and amount of anticipated investment of capital and other resources which applicant believes will be required to bring the invention to practical application;

(2) A statement as to applicant's capability and intention to fulfill the plan, including information regarding manufacturing, marketing, financial, and technical resources;

(3) A statement of the fields of use for which applicant intends to practice the invention; and

(4) A statement of the geographic areas in which applicant intends to manufacture any products embodying the invention and geographic areas where applicant intends to use or sell the invention, or both;

(i) Identification of licenses previously granted to applicant under Federally owned inventions;

(j) A statement containing applicant's best knowledge of the extent to which the invention is being practiced by private industry or Government, or both, or is otherwise available commercially; and

(k) Any other information which applicant believes will support a determination to grant the license to applicant.

§ 1245.208 Processing applications.

(a) Applications for licenses will be initially reviewed by the Patent Counsel of the NASA installation having responsibility for the invention. The Patent Counsel shall make a preliminary recommendation to the Director of Licensing, NASA Headquarters, whether to: (1) grant the license as requested, (2) grant the license with modification after negotiation with the licensee, or (3) deny the license. The Director of Licensing shall review the preliminary recommendation of the Patent Counsel and make a final recommendation to the NASA Assistant General Counsel for Patent Matters. Such review and final recommendation may include, and be based on, any additional information obtained from applicant and other sources that the Patent Counsel and the Director of Licensing deem relevant to the license requested. The determination to grant or deny the license shall be made by the Assistant General Counsel for Patent Matters based on the final recommendation of the Director of Licensing.

(b) When notice of a prospective exclusive or partially exclusive license is published in the **Federal Register** in accordance with § 1245.206(a)(1)(iii)(A) or § 1245.206(b)(1)(i), any written objections received in response thereto will be considered by the Director of Licensing in making the final recommendation to the Assistant General Counsel for Patent Matters.

(c) If the requested license, including any negotiated modifications, is denied by the Assistant General Counsel for Patent Matters, the applicant may request reconsideration by filing a written request for reconsideration within 30 days after receiving notice of denial. This 30-day period may be extended for good cause.

(d) In addition to, or in lieu of requesting reconsideration, the applicant may also appeal the denial of the license in accordance with § 1245.211.

§ 1245.209 Notice to Attorney General.

A copy of the notice provided for in §§ 1245.206(a)(1)(iii)(A), and 1245.206(b)(1)(i) will be sent to the Attorney General.

§ 1245.210 Modification and termination of licenses.

Before modifying or terminating a license, other than by mutual agreement, NASA shall furnish the licensee and any sublicensee of record a written notice of intention to modify or terminate the license, and the licensee and any sublicensee shall be allowed 30 days after such notice to remedy any breach of the license or show cause why the license should not be modified or terminated.

§ 1245.211 Appeals.

(a) The following parties may appeal to the NASA Administrator or designee any decision or determination concerning the grant, denial, interpretation, modification, or termination of a license:

(1) A person whose application for a license has been denied;

(2) A licensee whose license has been modified or terminated, in whole or in part; or

(3) A person who timely filed a written objection in response to the notice required by §§ 1245.206(a)(1)(iii)(A) or 1245.206(b)(1)(i) and who can demonstrate to the satisfaction of NASA that such person may be damaged by the Agency action.

(b) Written notice of appeal must be filed within 30 days (or such other time as may be authorized for good cause shown) after receiving notice of the adverse decision or determination; including, an adverse decision following the request for reconsideration under § 1245.208(c). The notice of appeal, along with all supporting documentation should be addressed to the Administrator, National Aeronautics and Space Administration, Washington, DC 20546. Should the appeal raise a genuine dispute over material facts, fact-finding will be conducted by the NASA Inventions and Contributions Board. The person filing the appeal shall be afforded an opportunity to be heard and to offer evidence in support of the appeal. The Chairperson of the Inventions and Contributions Board shall prepare written findings of fact and transmit them to the Administrator or designee. The decision on the appeal shall be made by the NASA Administrator or designee. There is no further right of administrative appeal from the decision of the Administrator or designee.

§ 1245.212 Protection and administration of inventions.

NASA may take any suitable and necessary steps to protect and administer rights to NASA inventions, either directly or through contract.

§ 1245.213 Transfer of custody.

NASA having custody of certain Federally owned inventions may transfer custody and administration in whole or in part, to another Federal agency, of the right, title, or interest in any such invention.

§ 1245.214 Confidentiality of information.

Title 35, United States Code, section 209, provides that any plan submitted pursuant to § 1245.207(h) and any report required by § 1245.204(b)(6) may be treated by NASA as commercial and financial information obtained from a person and privileged and confidential and not subject to disclosure under section 552 of Title 5 of the United States Code.

James M. Beggs,

Administrator.

October 15, 1981.

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